AND COLD STORAGE CO.

Courtesy Sturtevant Division, Westinghouse Electric Corp.

Lubricate with TEXACO CAPELLA OILS

Cleaner operation for both refrigeration and air conditioning compressors results when you use *Texaco Capella Oils*. Efficiency is therefore higher, maintenance and operating costs are lower.

Texaco Capella Oils are especially refined for compressor lubrication. They have very low pour tests and very high resistance to carbon, gum and sludge formations. They keep compressor rings free and valves active. They are moisture-free and do not react with refrigerants.

Get the greatest possible efficiency and economy in your compressor operation. Use the *Texaco Capella Oils* recommended for your particular compressors and operating conditions. A Texaco Lubrication Engineer will gladly advise you.

Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 E. 42nd Street, New York 17, N. Y.

TEXACO Capella Oils

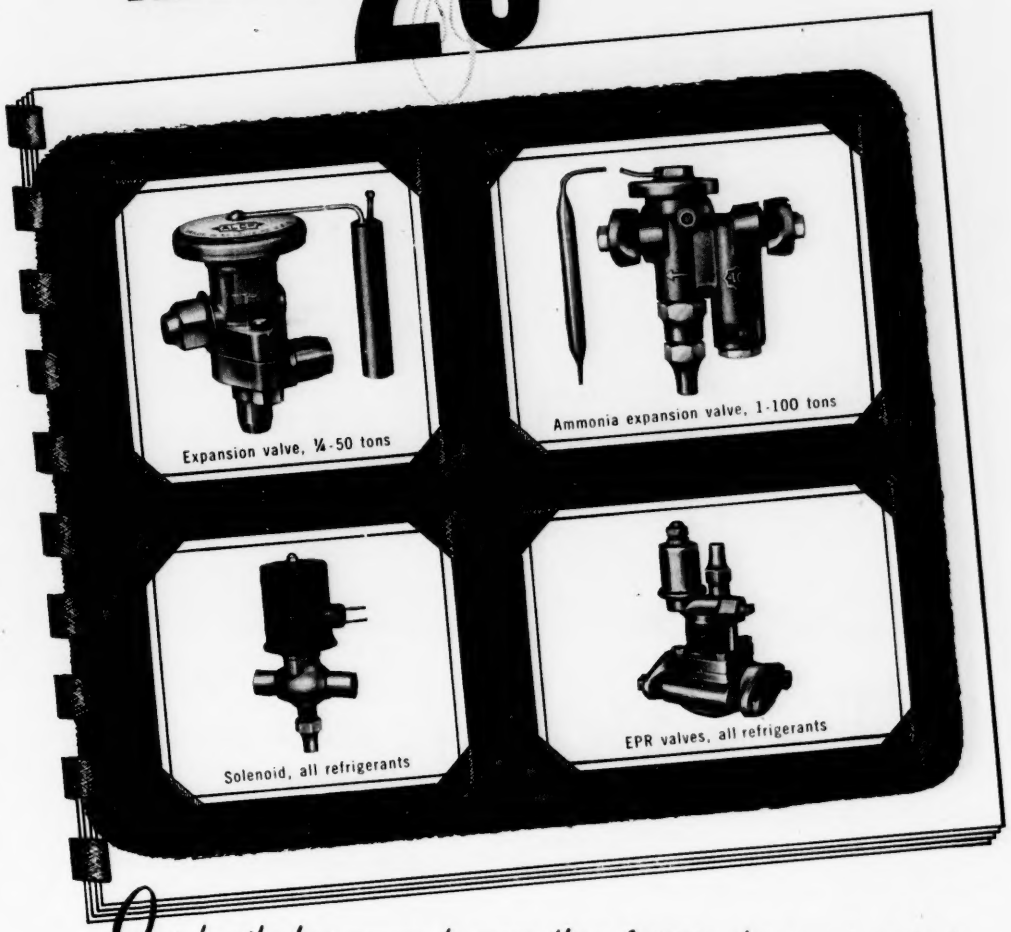
FOR ALL AIR CONDITIONING AND REFRIGERATING EQUIPMENT

TEXACO

TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

ICE AND REFRIGERATION, Vol. 118, No. 1. Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U. S., $3.00 per year; other countries, $4.00. Single copies, 35 cents. Copyrighted 1949 by Nickerson & Collins Co. Entered as second-class matter August 8, 1891, Chicago, Ill., under the Act of March 3, 1879. Additional entry at Beloit, Wisc.

ALCO'S 25th ANNIVERSARY



Our family has grown to more than 6,000 refrigerant controls.

ALCO has the *right* answer to every refrigerant control problem.
Write for detailed information on your intended use.

ALCO *has refrigeration under control!*

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

SEE YOUR ALCO WHOLESALER

ALCO VALVE CO.

835 KINGSLAND AVE. • ST. LOUIS 5, MO.

4123

New Year ~ 1950

January 1, 1950

Gentlemen:

At this time of the year, most of us like to sit back and think of the many new friends that we have made during the past year. Also, the many friendships which have been cultivated over a period of years, either through personal contact or good business relations.

It is with this in mind that we would like to express our sincere thanks to our many friends, who, with their co-operation and assistance have made the name "MARTOCELLO" popular throughout the world. A hearty thanks to the distributors, engineering and resale establishments for their loyalty and acceptance of our products.

To you, our old purchasers, we pledge our full support and continued good service; and to those who have not as yet tried our products, we invite you to do so. It is our desire to keep you at all times supplied with the materials which we have manufactured for the past thirty-three years.

To all we wish a happy and prosperous 1950, as we now look forward to our thirty-fourth year of serving the Ice Industry.

Sincerely yours,

JOS. A. MARTOCELLO & CO.

Jos. A. Martocello & Co.
"Serving the Ice Industry Since 1916"
229-231 NORTH 13th STREET
PHILADELPHIA 7, PA.
"There is no Substitute for MARTOCELLO QUALITY"

Martocello QUALITY

OUR PRODUCTS ARE MANUFACTURED FROM THE FINEST MATERIALS AND DESIGNED TO GIVE LONGER AND MORE EFFICIENT OPERATION

compare their **QUALITY** *and* **WORKMANSHIP** *with all others and satisfy yourself that they are the very best*

COMPLETE AIR AGITATION SYSTEMS AND ICE PLANTS

"HELPFUL SUGGESTIONS"

In some sections of the country, the water available for ice making contains calcium carbonate or chalk, which clings to the outside wall of drop tubes and finally clogs the perforations, thereby preventing them from blowing air until the final freeze. There have been various ways of removing this objectional substance, such as, rubbing with emery or sand paper and using our pin vises and drills of correct size to re-open the perforations. A faster and more practical method is to dip the drop tube into a container of muriatic acid and then into a container of water.

Another method suggested is to use vinegar in place of muriatic acid. Vinegar is cheaper and is of vegetable origin. This process has been found to be very successful.

This cleaning operation, when necessary, should be effected at the thawing tank where the drop tubes are removed from the cans.

REPRESENTED ON THE WEST COAST BY WESTERN ICE EQUIPMENT CO., 420 MARKET ST., SAN FRANCISCO, CALIF.

JOS. A. MARTOCELLO & CO.

229-231 North 13th Street **Philadelphia, 7, Pa.**

PLAN NOW

TO CUT POWER COST AND BOOST TONNAGE WITH

Vogt BRINE COOLERS

WRITE FOR COMPLETE DETAILS
ASK FOR BULLETIN BC2

DOWN GOES POWER COST AND UP GOES TONNAGE when old evaporators are replaced with modern, Vogt Brine Coolers. The reason . . . maximum evaporating surface packed into a minimum of space with correct design and sound construction the controlling factors.

Vertical Multipass type coolers can be furnished for use where floor space is limited and ample head room is available.

MULTIPASS TYPE

The cooler for closed brine systems in cold storage plants, dairies, packing plants, oil refineries, etc., requiring units of large capacity.

LOWER YOUR POWER COST

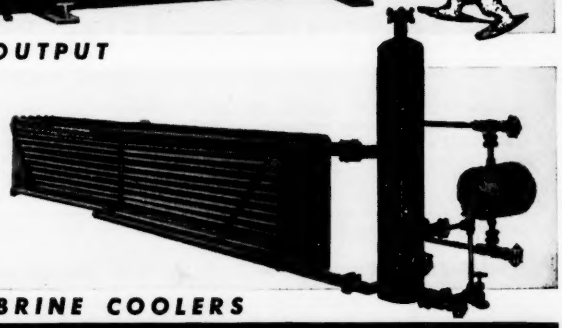
SINGLEPASS TYPE

Standard for ice freezing tanks and ideal where multiple can lifts are used. Large gas liberation area and rapid circulation of brine makes this a very efficient unit.

RAISE TONNAGE OUTPUT

COIL TYPE

Recommended for ice freezing tanks and other refrigerating purposes where space is limited. The gas is quickly liberated and a high rate of heat transfer is effected.



INSTALL MODERN VOGT BRINE COOLERS

HENRY VOGT MACHINE CO., Inc., · · · · · LOUISVILLE 10, KENTUCKY

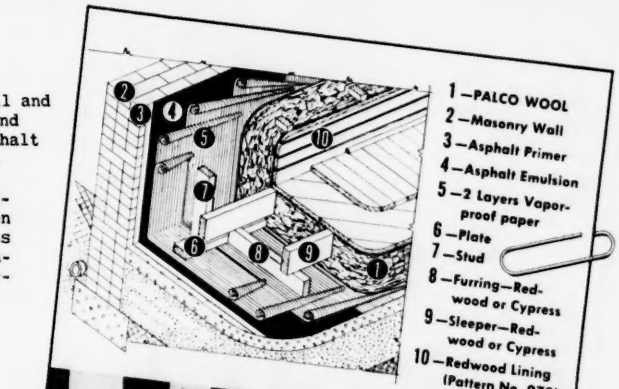
Branch Offices: New York - Chicago - Cleveland - Philadelphia - Dallas

INSTALLATION FILE NO. 1001

How to get maximum efficiency with PALCO INSULATION WOOL

Recommended

FREEZER CONSTRUCTION—FOR MASONRY BUILDING: The masonry wall and floor should be thoroughly brushed and cleaned, then vapor-proofed with asphalt primer, asphalt emulsion, and vapor-proof paper, lapping 4 inches and cementing the laps with asphalt emulsion. Sleepers and studding are then installed and PALCO WOOL is placed as the laying of sub-floor, wall sheathing, and ceiling progresses. The arrangement of sleepers as shown provides a minimum of solid wood connection through the insulation. Vapor-proofing extends under the anchored furring strip and continues on the warm side of the insulation over the ceiling. Ceiling vapor barrier should consist of two layers of vapor-proof paper lapping each layer 4 inches and cementing the laps with asphalt emulsion. Vapor-proof paper should be omitted on the cold side of the insulation. This arrangement of studding and ceiling joists provides continuous insulation and vapor sealing at juncture of wall and ceiling. When the normal water table of ground is less than 8' to 10' below bottom level of insulation, an engineer should be consulted and insulation thickness increased as recommended.



Applied

BURRIS BROS. LOCKER PLANT AT FRANKLINTON, LOUISIANA—Typical application of PALCO WOOL INSULATION. Flameproofed protection, moisture resistance, and thermal conductivity of only .255 Btu represent only a few of many reasons why PALCO WOOL was selected as the ideal low temperature insulation.

NATURE'S INSULATION · FROM AGE-OLD REDWOOD BARK · FLAMEPROOFED

Mail attached coupon today for more detailed information.

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5225 WILSHIRE BLVD., LOS ANGELES 36, CALIFORNIA
35 EAST WACKER DRIVE, CHICAGO 1, ILLINOIS

THE PACIFIC LUMBER COMPANY
100 BUSH STREET
SAN FRANCISCO 4, CALIFORNIA

Please send me without obligation:

☐ PALCO WOOL COLD STORAGE MANUAL
☐ LOCKER PLANT PLAN AND CONSTRUCTION MANUAL

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Title _____
Company _____
Street _____
City _____ Zone _____ State _____

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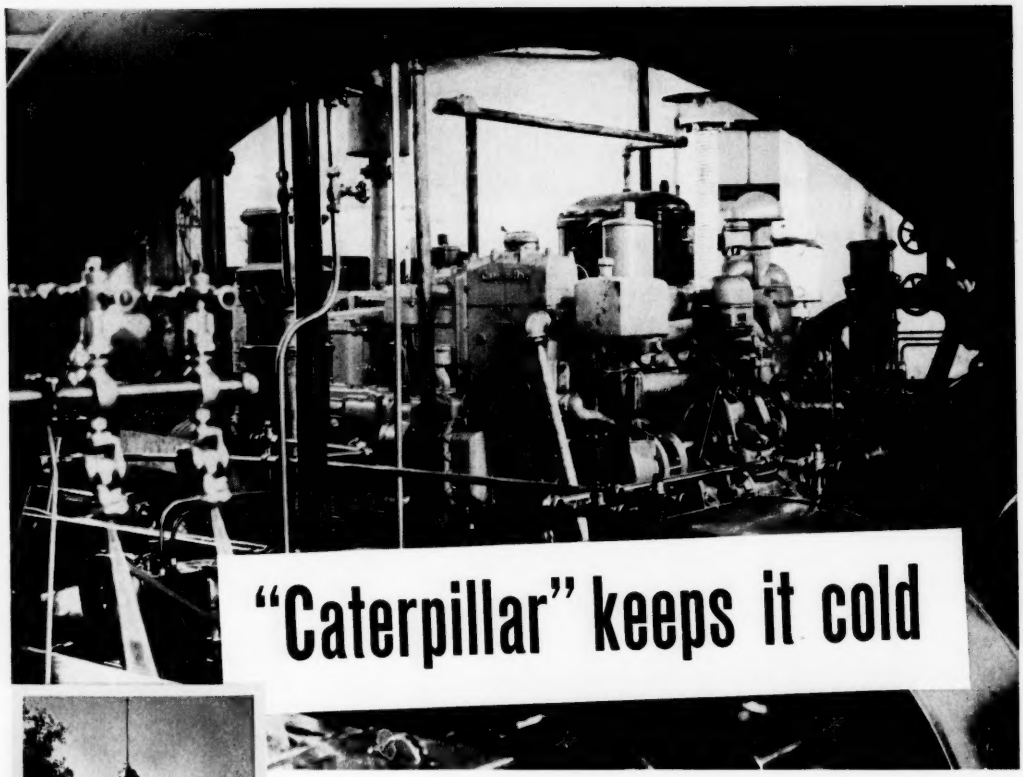
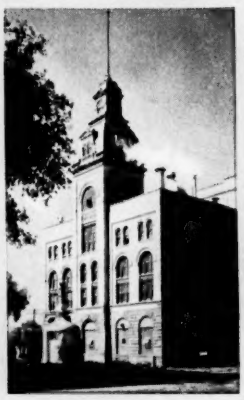


"Caterpillar" keeps it cold



Three "Cat" Diesel D8800 Engines power the refrigerating system at the Fox Head brew house, Waukesha, Wis.

IN THE big, modern brew house of Fox Head Brewing Co., at Waukesha, Wisconsin, a team of three "Caterpillar" Diesel Engines handle a big refrigerating job.

Each engine powers a 50-ton Frick ammonia compressor. Together they cool 720 barrels of beer a day, working to the exacting temperatures required for a fine brew.

Says J. Q. Knight, Chief Engineer: "I got onto the job of operating these 'Cat' Engines in 15 minutes. They're so simple and dependable all we have to do is start 'em and stop 'em as power demands change. They're flexible, too – deliver full power for peak cooling requirements, or throttle down for light loads."

Your "Caterpillar" dealer has the right size engine for *your* ice-making or refrigeration job – and the parts and service facilities to keep it working profitably long after it's paid for itself. Ask him for a demonstration, or send the coupon today.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

LOOK UNDER THE HIDE

Lubricating oils break down at high operating temperatures, forming carbons and gums—enemies of long engine life. To prevent lube oil breakdown, "Caterpillar" Engines are equipped with oil coolers. Pistons are oil sprayed to remove heat. Controlled oil temperature preserves lubricating qualities—reduces maintenance costs—adds to owner profits. *Look under the hide for quality.*

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

CATERPILLAR TRACTOR CO.
Box IR-1, Peoria, Illinois

Please send me your latest booklet, "Refrigeration Assured."

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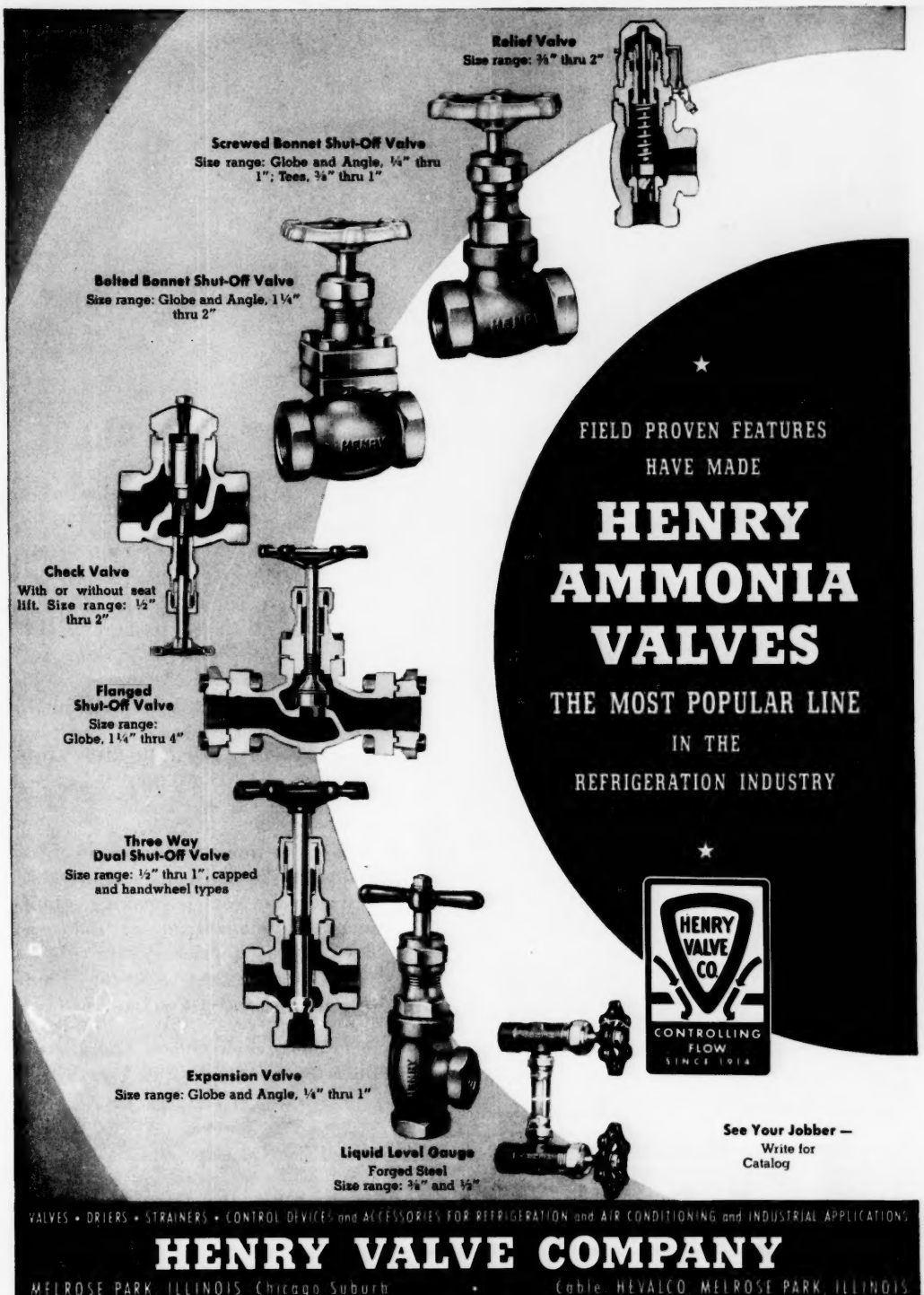
ADDRESS _____

CITY _____ STATE _____


Relief Valve
Size range: 3/8" thru 2"
Screwed Bonnet Shut-Off Valve
Size range: Globe and Angle, 1/4" thru 1"; Tees, 3/8" thru 1"
Bolted Bonnet Shut-Off Valve
Size range: Globe and Angle, 1 1/4" thru 2"
Check Valve
With or without seat lift. Size range: 1/2" thru 2"
Flanged Shut-Off Valve
Size range: Globe, 1 1/4" thru 4"
Three Way Dual Shut-Off Valve
Size range: 1/2" thru 1", capped and handwheel types
Expansion Valve
Size range: Globe and Angle, 1/4" thru 1"
Liquid Level Gauge
Forged Steel
Size range: 3/8" and 1/2"
FIELD PROVEN FEATURES
HAVE MADE
HENRY AMMONIA VALVES
THE MOST POPULAR LINE
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REFRIGERATION INDUSTRY
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Write for Catalog
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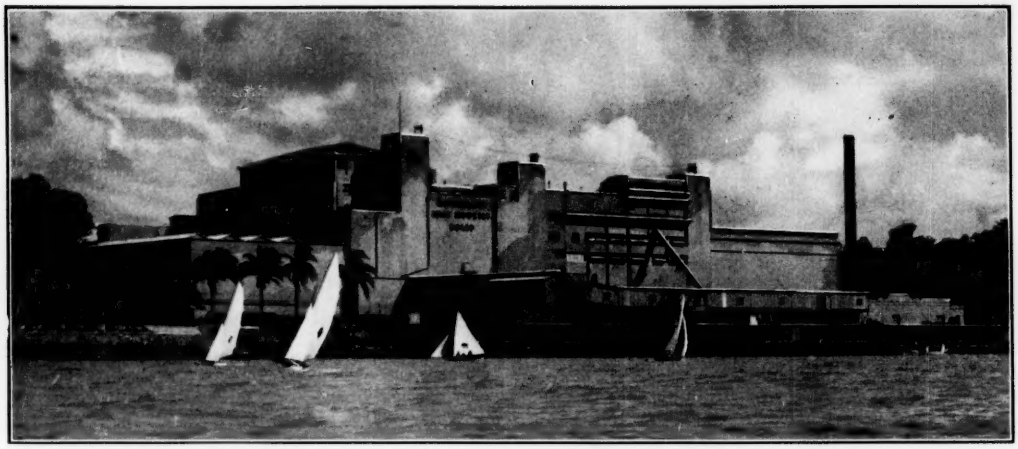
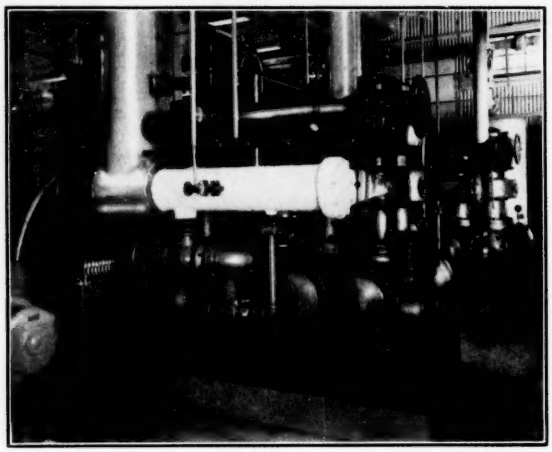
Cable HEVALCO MELROSE PARK, ILLINOIS



BIG AUSTRALIAN PACKING PLANT INSTALLS Frick Refrigeration

The Queensland Meat Industry Board recently installed three Frick ammonia booster compressors for producing low temperatures at the Brisbane Abattoir. The Board says these big machines, each with four cylinders of 15 inches bore and 10 inches stroke, "have worked very efficiently", and have increased the output of the freezers at Brisbane by 26%. Annual capacity of the plant now approximates 250,000 cattle, 150,000 calves, 50,000 hogs, and 700,000 sheep and lambs.



Two of Three Frick Compressors at Brisbane

Whether you're in Augusta or Australia, if you need air conditioning, refrigerating or ice-making equipment in commercial or industrial sizes, there's a Frick system to meet your requirements. Ask for recommendations and estimates.

Frick Branch Offices and Distributors in principal cities everywhere.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

Also builders of Power Farming and Sawmill Machinery

HOWE

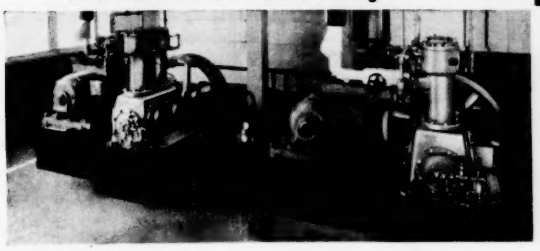
KEEP YOUR PRODUCTS at peak-of-perfection and push up profits with Howe Refrigeration Equipment! Provides that exact temperature and humidity control which saves money, time, labor. Quick freezing and frozen food locker plants, meat packers, ice cream and dairy plants, ice and cold storage plants, all are profiting by Howe's tested-and-proved refrigeration knowledge, acquired through 37 years as specialists. Howe equipment is correctly designed and engineered for top performance . . . ruggedly built to precision standards . . flexible to handle peak loads economically.

CONSULT HOWE on all your refrigeration problems. Since 1912 manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment. Immediate delivery!

A few territories for new Distributors are available. Your inquiry invited!

HOWE

Two 20-Ton Machines for Quick Freezing



Gentlemen:

Tell us more. Please send literature.

Name.....

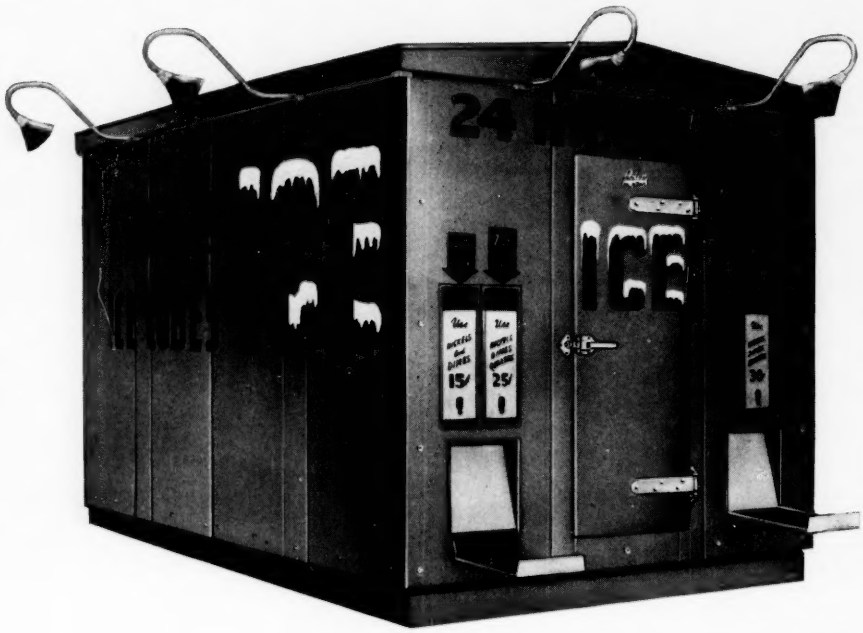
Position.....

Firm .....

Address.....

POLAR REFRIGERATED ICE STATIONS and AUTOMATIC ICE VENDORS

Equipment that pays for itself over and over again!



Polar Vendors and Stations are silent salesmen that are on duty day and night making cash sales for you! Your customers will appreciate the fact that they can serve themselves in ten seconds from conveniently located Polar units which provide automatic ice service 24 hours a day, every day of the year.

Besides collecting for every nickel's worth of ice you sell, Polar equipment will also keep a permanent record of sales made for each vendor is equipped with an automatic counter.

All Polar vendors have the famous coin accumulator which adds the customer's change in nickels, dimes and quarters to make a set sale. It rejects slugs and foreign coins and returns the customer's money when the conveyor belts are empty. This coin unit is housed in a strong box which is completely burglar-proof.

Polar Ice Stations are sturdily built of heavy gauge aluminum and insulated with 6½" of high density Fiberglas, completely vaporsealed. Surplus power refrigeration units further insure economical operation, and zero temperatures are guaranteed at 95° temperature difference.

Polar Ice Vending Equipment is guaranteed against defects in materials and workmanship . . . guaranteed to give you satisfactory service. Prices are F.O.B. your station in car lot orders or on orders totalling $7500.00 or more.

You can depend on Polar Equipment to boost your sales and profits. We invite you to investigate now the profit possibilities of merchandising ice the Polar way. With Polar equipment you'll increase your volume of business and at the same time LOWER YOUR DISTRIBUTION COSTS!

WRITE TODAY FOR COMPLETE INFORMATION

REFRIGERATION ENGINEERING COMPANY

211 Foshay Tower, ● **Minneapolis 2, Minnesota**

THE CREAMERY PACKAGE MFG. COMPANY
General & Export Offices: 1243 W. Washington Blvd., Chicago 7, Illinois

CREAMERY PACKAGE MFG. CO. OF CANADA, LTD.
267 King Street West, Toronto 2, Ontario

THE CREAMERY PACKAGE MFG. COMPANY, LTD.
Avery House, Clerkenwell Green, London, England

The *DEMAND* Is for QUALITY ICE

For Ice That Will Not Produce Slime In Ice Boxes...

Use DISTILEX This Way...

Dispense with Soda Ash, Sodium Aluminate, Alum and Similar Products . . . and

SIMPLY MIX DISTILEX WITH THE LIME YOU ARE NOW USING!

Block on left treated with Distilex, only one core emptied. Right, untreated water, cores were emptied twice. Most Distilex users do not empty cores at all

RESULT . . . . High-grade Crystal Ice from raw water . . . Ice free from slime and deposits . . . Ice without color, odor, taste . . . Ice which can be produced at very low temperature* with no cracking while being frozen, dumped or cut.

***DISTILEX** treated water can make Ice in LESS THAN 35 HOURS at 10° brine temperature!

Test DISTILEX in your plant. If not entirely satisfied, purchase price will be refunded on all DISTILEX returned. $25.00 per 100 lbs., f.o.b. Birmingham.

Use SOLVEX for COMPRESSOR COOLING SYSTEMS

HIGH HEAD PRESSURES QUICKLY LOWERED with this remarkable chemical. SOLVEX can be quickly applied without breaking a joint. REMOVES RUST, SCALE, ALGAE, OIL AND ENCRUSTING MATTER from condenser tubes and water jackets in one to five days operation. Ideal for cleaning scale and corrosion from boilers, heaters and tanks.

An effective conditioner for spray ponds and cooling towers. SOLVEX goes to work immediately WITHOUT COSTLY SHUTDOWNS. Cooling efficiency is rapidly restored by using one pound per 10 gallons of water.

Write NOW for Further Particulars on These MONEY-SAVING AIDS TO BETTER ICE MAKING!

The CSCO STABLEIZER MAINTAINS GOOD BRINE by a positive reaction to either OVER-ACIDITY or OVER-ALKALINITY!

A scientific combination of pure metals upon which damaging materials in brine will "feed" in preference to the brine tank or ice cans, thereby SAVING them!

the CSCO STABLEIZER removes destructive material from the brine without adding harmful chemicals. Easily installed in all systems. No other brine treatment compares in SAFETY! The STABLEIZER does not make brine harmful to workmen's hands. PROTECTS AND PRESERVES EXPENSIVE EQUIPMENT!

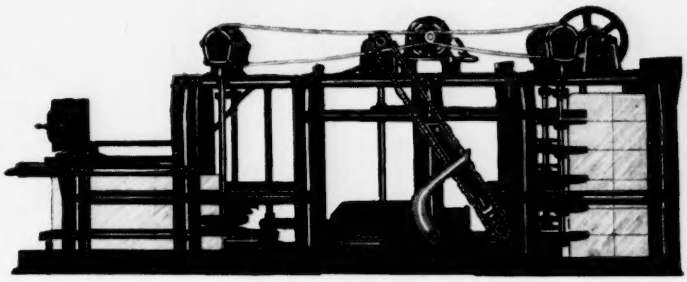
CHEMICAL SOLVENT COMPANY

3005—16th Street North **Birmingham, Ala.**

★ *Perfection* A MODEL FOR EVERY REQUIREMENT ★

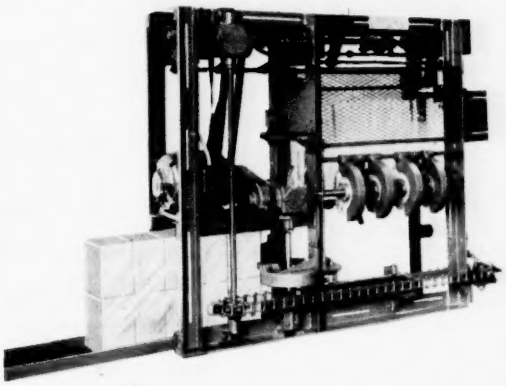
PERFECTION SPECIAL

The Perfection Special receives ice blocks on edge, scores them and discharges them standing on end. Capacity 4½ blocks per minute or 270 blocks per hour. This is really two machines in one — a combined heading and scoring machine — a sturdily built long-lived machine.



PERFECTION MILLER

The Miller machine receives the ice block on edge, completely scores it and discharges the block on edge in one operation. Capacity 6 blocks per minute or over 50 tons per hour. Quite a number of these machines over 20 years of age are still scoring ice and giving satisfactory service.



NOW . . . is the time to consider next year's requirements. If you need an ice scoring machine, it is most economical to buy the BEST . . . get a "PERFECTION."

Write, wire or phone: Fort Worth 3-1258 for more information.

Combating a 12,000 gpm Corrosion Threat in the

"AIR-CONDITIONED CITY"

To completely air-condition the 1000-room Rice Hotel at Houston, Texas, 12,000 gallons of water per minute must be circulated between the engine room and the giant cooling tower on the roof of the hotel garage, 700 feet distant. To combat the inescapable corrosive attack, the engineers used Byers Wrought Iron plates in fabricating the 18-inch pipe which handles the flow. A substantial quantity of Byers Wrought Iron pipe was also supplied for cooling and condenser water lines within the hotel building.

Houston, which claims more air-conditioning than any other city in the world except Washington, D.C. calls itself the "Air-Conditioned City". This concentration of installations gives engineers and users ample opportunity to determine the worth of various materials. It is significant that wrought iron appears in practically every specification.

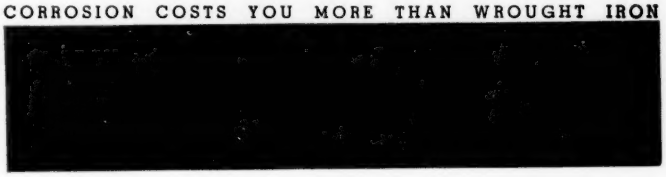
The durability of wrought iron in services like these comes from the unusual character of the material. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack. The fibers also anchor the initial protective scale, which shields the underlying metal just as a scab protects a wound.

If you are contemplating any air-conditioning installations, or are concerned with the maintenance of any existing systems, you will find some helpful information on the use of wrought iron in our bulletin, WROUGHT IRON IN REFRIGERATION, ICE SKATING RINKS AND AIR-CONDITIONING SYSTEMS. Ask for a complimentary copy.

J. RUSS BATY, Architect on Hotel Garage; REG F. TAYLOR, Consulting Mechanical Engineer; CHAS. G. HEYNE & CO., Mechanical Contractors on Air Conditioning; KANE BOILER WORKS, Fabricators of 18" pipe; O. W. ROSIN, Chief Engineer, Rice Hotel.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, San Francisco. Export Division: New York, N. Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON



J. F. NICKERSON, Founder

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SAYS E.T. LEMONIS, MANAGER, MOHICAN HOTEL, NEW LONDON, CONN.

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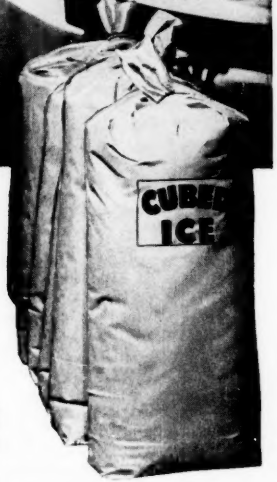

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IN THIS ISSUE —

Refrigerated Storage Costs

Part III of the series on cold storage costs by D. O. Haynes and James W. Straub carries on into the next step of details of cost determination and allocation. A work sheet is given to analyze the various refrigeration loads, carry them over to power equivalents and check the data with system power consumption. In the article on page 45, useful charts and work factors are also presented.

Treatment of Peaches For Refrigerated Storage

An article in the October issue by Professor Cardinell discussed results obtained from the study of "Stericooling" peaches before loading them into pre-iced refrigerated railroad cars. An additional study has been made of methods that would maintain longer market life of the best peaches. A discussion of this study and some of the conclusions are given in the article on page 49.

Refrigerated Warehousing Review

A fairly average successful year for the refrigerated warehousing industry was reported for 1949 with decreased occupancy in some cases but increased or about the same occupancy in others. For 1950 a slight decline is expected, but with a probably leveling off some time during the year. This review, an annual feature of ICE AND REFRIGERATION starts on page 55.

Ice Industry Review

The review of the ice industry for 1949 shows a mixed picture of gloom and cheer; ice sales as a whole were down, but processed ice sales were definitely up. Refrigerator and ice appliance sales were disappointing, but opinions on the ice advertising program and the outlook for 1950 were almost entirely favorable. For this annual review see page 64.

Education for Operating Engineers

The man who operates a refrigerating plant must know what is going on inside the system and how to keep it in good operating condition. These requirements of knowledge can be fulfilled in several ways according to H. G. Venemann, page 74. Professor Venemann details the sources of engineering knowledge and tells how it may be acquired.

Pre-Convention — NARW

This is the pre-convention issue of ICE AND REFRIGERATION for the annual conventions of the American Warehousemen's Association and the National Association of Refrigerated Warehouses to be held at the Edgewater Beach Hotel, Chicago, Ill., January 30 to February 2, 1950. In this issue there are historical sketches and other features, as outlined below, of special interest to the refrigerated warehousing industry.

The first issue of ICE AND REFRIGERATION, July 1891, carried an article on a new cold storage plant and other articles and items on the refrigerated warehousing industry. Subsequent articles, items and convention reports, published in practically every issue since then, provide a unique record of progress. From this source has been drawn material for the historical sketch on page 19.

Looking backward from 1950, some of the leading refrigerated warehousemen point out the significant steps in growth and mechanical improvements in the industry and the accomplishments of the Association. See page 21.

The facilities and methods used in the marketing of frozen foods recently was the subject of a study made by the Marketing Facilities Branch of the U. S. Dept. of Agriculture. A detailed extract of the section on warehousing starts on page 23.

"What can refrigeration do to protect coffee quality?" This question was presented to The Refrigeration Research Foundation which initiated an investigation at Purdue University. The report by C. E. Baker is on page 29.

Pictures of all officers and members of the Executive Committee, and a complete list of all officers, executive committeemen, chapter officers of NARW and the directing personnel of TRRF are shown, starting on page 36.

An official welcome to Chicago is extended by Wm. A. Kopke, only Chicago member of the NARW Board of Directors, page 38. A message from association headquarters from President Otis lists some of the more outstanding accomplishments of the association during 1949 and a similar message from Wm. Dalton, executive vice-president gives a review of the convention, page 38.

A new folder, printed in two colors, designed for quick reading has been issued by the National Association of Refrigerated Warehouses to keep customers and prospective customers informed regarding the services available from refrigerated warehouses. See page 41.

Information on the temperature and humidity conditions necessary to maintain the quality of confectionery, and of peanuts and pecans used in the manufacture of candy, has long been needed by the confectionery industry. Research at the Georgia Experiment Station is expected to provide answers to this question. See page 42.

Organized in 1943 by a group of refrigerated warehousemen, The Refrigeration Research Foundation has done a great deal to place the low temperature preservation of food on a generally scientific basis. The story of its work is told in the article on page 43 by Dr. (Dutch) Diehl who organized its research program and has directed it since it was organized.

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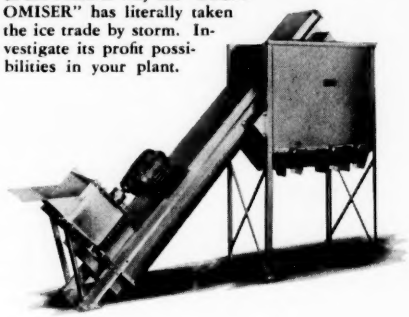

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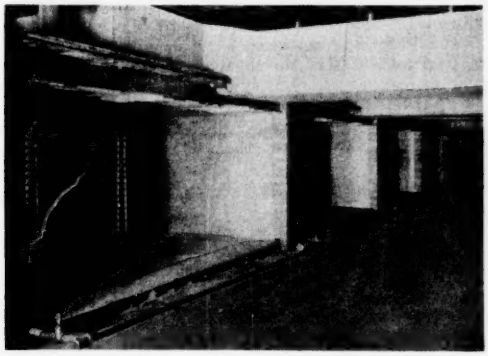
High Lights From Six Decades of Progress in Refrigerated Warehouses

By Emerson Brandt
Technical Editor, Ice and Refrigeration

The first issue of ICE AND REFRIGERATION in July, 1891 carried an article on a new cold storage plant as well as other articles about the business. The issues through a period of 58 years are a cumulative history of the development of the industry, its plants and operations. Material has been drawn from this extensive source to prepare a few high-lights from events during this period.

THE early literature on cold storage gives two impressions to the modern reader. The pioneers not only discovered commercial methods of holding goods at reduced temperature but also discovered that these goods had a certain inherent durability which contributed to expanded storage life. It may also be true that early standards for so-called fresh goods were considerably lower than they are today so that cold stored goods did not suffer by comparison with fresh products.

For instance game was much more plentiful in the early days and laws for its conservation placed little restriction on the hunter. For this reason markets were quickly flooded with game in the season and experiments were tried to hold this game for better markets. Since methods of handling were not too highly developed, it is probable that the game coming directly to market was not particularly fresh so that the portion frozen in the field and cold stored did not suffer too much by comparison.



Forced air blast coolers in 1900. "Cooling pipe chambers are situated on the sixth floor, one for each of the five floors below. In each of these chambers, which are lined with galvanized iron, large quantities of galvanized iron pipe coils are placed, through which the brine, at a temperature of 15 F., is circulated. Two large exhaust fans are used in connection with each room. A series of warm and cold air ducts connects each cooling pipe chamber with its separate room. The air is drawn from the rooms, passed over the cooling pipe coils, cooled down to the proper temperature, and is then forced down into the rooms again. (Text and illustration from ICE AND REFRIGERATION, September 1900).

Up to 1890 a number of cold storage rooms were refrigerated with ice piled in a room above and rather crude arrangements for circulation of air over the goods. In addition it is apparent that much remained to be learned about piling of goods to give interior air circulation and avoid natural heating in the piles.

Even where room coils were later employed the required arrangement and the amount of surface needed were not too well understood. This resulted in poor air circulation and led to moisture problems in the storage rooms. Early designers and builders, therefore, speak frequently of their desire to keep the air in the rooms sweet and dry. Drying agents such as calcium chloride and lime were frequently used to obtain these air conditions according to articles during this period.

Another problem the industry faced was the difficulty of exercising sufficient control over the quality of the goods as received. To a much smaller extent the same problem remains today. Sixty years ago the industry faced it in rather acute form because much of the goods offered to the warehouse was in fact surplus. Most commodities were produced for existing markets and later it had to be determined what part was surplus before it moved into storage. This situation differed from the present when so much goods is produced, harvested and processed specifically for refrigerated warehouse holding.

Recommended Temperatures

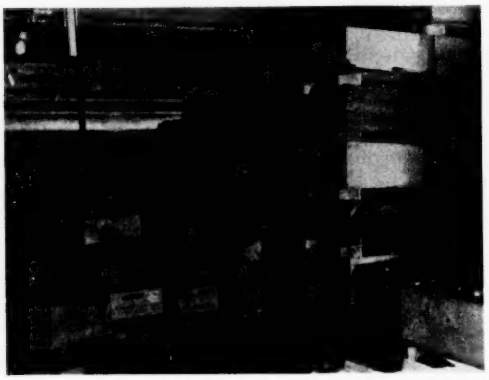
The conditions maintained in early warehouses were established primarily by trial and error on the part of many pioneers. The November 1892 issue of ICE AND REFRIGERATION had an article on recommended cold storage temperatures from which the following was taken:

APPROVED TEMPERATURES FOR ARTICLES IN COLD STORAGE (1892)

ARTICLES	F.	REMARKS
Apples	32 to 36	According to quality.
Bananas	34	Two or three days
Lemons	33 to 36	
Oranges	34 to 36	
Pears	34 to 36	
Beef, fresh	36	If previously refrigerated; from slaughter house, 32 to 34F. for two days; then 36F.
Hogs	29 to 32	Apt to get slimy if above this temperature.
Butter	32 to 38	These goods should be kept separate from other goods; eggs should be turned occasionally; rooms to be kept sweet and dry.
Eggs	32 to 34	
Poultry, dressed, iced	30	
Poultry, dry picked	26 to 28	
Poultry, scalded	15 to 28	If kept long, 15 F. Low temperatures are apt to spoil their appearance when taken out.
Game	32 to 36	After freezing, which is the best, keep at 20-24 F. to prevent shrinking.

The article requested comments from readers and subsequent editions show that many were received. Apparently there was an early fear of too low temperatures in the freezer zone. For instance, the idea was widely shared that butter would be ruined by low temperature but this was rather quickly dispelled in succeeding years. Meat, poultry and fish freezing were employed prior to 1890 and the practice expanded rapidly as the cold storage industry grew.

By 1895 there were a number of plants which had dropped their temperatures in sharp freezers to the range of minus 10 to minus 15 F. High velocity air blast freezers are not new as study of the early literature shows. Descriptions and illustrations of shelf coil freezing rooms were published during the 1890's and apparently the idea had been used earlier. A number of freezing rooms were refrigerated with blower circulated air, chilled by coils in a central room connected by air ducts to the freezers. In some cases brine spray was used over the coils to increase heat transfer and prevent frosting.



Early apple storage (1895). In this illustration blocks placed between boxes to provide space for air circulation show that the fundamentals of live fruit preservation were understood. The fruit however did not have the careful wrapping and packing employed today which indicates some of the problems then faced by the warehouse. (From ICE AND REFRIGERATION, December, 1895).

Toward the end of the century, detailed articles appeared on the storage of specific commodities. While some of the ideas expressed were later shown to be wrong, there was rather general appreciation of good storage practice. Consideration was given to the combined effects of temperature, relative humidity and air circulation—which continue to be most important.

Coil and baffle designs to provide good air circulation were much used and blower circulated air systems expanded. They were considered especially desirable for egg rooms. This was true despite the fact that extensive dehydration was then known to be undesirable. Probably eggs offered for storage in those days were not such good quality and required more air circulation as an offsetting factor. During this period egg candling was developed in Europe and adopted here to make quality determinations somewhat more accurate.

Public Relations

The cold storage industry showed early appreciation of public relations and it had quite a task to overcome many misconceptions on the part of the public. Possibly newspapers on dull days used scare stories on cold storage to excite interest and fill space. For example an article in a Philadelphia paper told how lemons stored with eggs would turn them putrid within one hour. Of course even in that day (1896) it was not customary to store lemons and eggs together, but it was never substantiated that lemons would have such rapid and bad effects upon eggs.

The early days of the present century were marked by progress on the structural side. Concrete construction came into wider use as many fireproof buildings were erected by refrigerated warehousemen and the buildings began to employ features utilized up to the present time.

Some of the plants erected around 1905 had wall insulation installed to provide a continuous film unbroken by floors projected through it. Cork board insulation began largely to replace the wood and paper or fill types of insulation previously used. Waterproofing and moisture exclusion became widely recognized for their part in breaking down insulation and all practical methods then available were employed to reduce diffusion of moisture in the insulation.

Some of the early warehousemen also had foresight on matters which bother their present day descendants. Shortly after the turn of the century the warehousemen were giving thought to building design and equipment aimed at reducing labor costs.

Cold Storage Rates

In 1907 the American Warehousemen's Association compiled, and Nickerson & Collins Co., published, a "Warehousemen's Rate Guide." This publication ran through three editions, the last dated 1912. A very large number of items were covered and some examples are given in the table below.

COLD STORAGE RATES—1912

	1ST MONTH	2ND MONTH
Apples, box	6	4
Butter per cwt.	25	12½
Cheese per cwt.	15	10
Eggs, case	10	7½
Eggs, frozen, per cwt.	12½	12½
Fish, frozen, per cwt.	25	25
Citrus fruit, box	10	7½
Lard, per cwt	10	10
Meat, freezer, per cwt.	25	25
Nuts, per cwt.	12½	12½
Pears, box	6	5
Poultry, freezer, per cwt.	25	25

A comparison with rates published at the present time by individual warehouses proves interesting. Many of the rates have advanced very little during the succeeding 37 years. Yet this same 1912 publication suggests that special services be billed on the basis of time consumed at the rate of 40 cents per man per hour. It is presumed that this 40 cent rate included overhead and profit for the warehouse. When present day building and operating costs are considered it is apparent that operating margins have been greatly reduced.

Articles about this time mentioned the application of sprinkler systems to refrigerated warehouses for fire prevention. Other innovations were special provisions made for motor truck delivery of storage goods. There is also mention of speedier handling of the commodities with less labor.

The industry began another period of more rapid expansion, and study of lay-outs and specifications indicates that more pipe was used in the storage rooms and that it was better installed to give more positive air circulation.

Electric power for driving refrigerated machines and auxiliaries began to expand more rapidly. At the same time ammonia compressors operating a higher speed began to be installed.

Meanwhile the cold pack process for freezing berries and fruits had developed into a considerable commercial activity. All of the goods, however, was frozen in barrels or large containers for use by bakers, preservers, and others in the commercial field. The general public knew nothing of this and many years later would view the freezing of fruits and vegetables as a wholly new development.

World War I gave impressive evidence of the value and importance of cold storage. There was a certain amount of expansion during the war and an increase in plants continued at an accelerated rate for about eight years afterward. Then expansion was very slight for some years.

Quick Frozen Foods

In 1928-29 there was quite a flurry in connection with quick frozen foods. In retrospect, it is evident equipment for transporting and for merchandising such foods at retail was not yet available although the refrigerated warehouses which had been handling frozen foods for forty years provided facilities for storage. At any rate economic conditions slowed the development considerably and it did not reach any particular importance until about ten years later.

When frozen foods in consumer size packages became a prominent commodity, there was more emphasis on the speed and cost of handling these goods. Shortly thereafter World War II came along with its manpower shortage, and even greater emphasis on speed of handling. A certain amount of new warehouse space was constructed—some of it was special purpose space in which goods were concentrated for overseas shipment. In any case speed of handling was paramount and single floor construction was utilized.

Meanwhile labor costs went through a process of continual inflation and the single or two floor warehouse showed promise in the direction of reducing handling costs as well as accelerating the movement of goods. Thus the first significant new trend in more than twenty years came into the refrigerated warehouse industry. There is no doubt that it is a permanent trend for new construction. On the other hand multi-floor warehouses are adapting their operations to modern requirements and maintaining their position in the overall picture.

The National Association of Refrigerated Warehouses continues to serve as a clearing house through which the members can pool their experiences to arrive at the best industry practice in the storage of goods. In 1943 however the association set up The Refrigeration Research Foundation to develop fundamental knowledge for both the warehouse and the storer of goods.

The action stands as the most significant in the sixty years of industry operation because it promises solution of the four problems which have been most pressing since the beginning.

1—To bring top quality, well packed goods to the warehouse.
2—How to determine the quality of goods as received for storage.
3—What conditions in the storage contribute to the best holding of the goods.
4—Public understanding of quality and value of cold stored commodities.

Trends in Refrigerated Warehousing—Looking Back From 1950

THE National Association of Refrigerated Warehouses being a progressive institution has accomplished much during the past 59 years. My introduction into the industry was in 1921 or about 28 years ago, and during that time I have noted many improvements that resulted to the mutual advantage of both the customers and ourselves.

I was first attracted by the caliber and courage of the men then in the industry whom I am happy to hold in my memory as originators of ideas that were developed as time went along, and to whom the industry is indebted for many of its high standards today. I am thinking of such men as Gardner Poole, George Lovejoy, Will Mason. Homer McDaniel, Odom Mackey, Frank Horne, and Royal Switzler in particular, and many others who in the meantime have passed on to the great beyond.

There is hardly a function or a practice that since my memory of the early history of the industry has not changed entirely or been improved—the style of buildings, power plant, product handling, safety devices, and new commodites for storage. New plants today give emphasis to low, long buildings with more room ceiling height, and with special equipment to control humidity. Handling product from and to the car and the pile with more efficiency and at a lower cost of operating has brought about the introduction of palletizing now in general use where practical.

Research is the most advanced step taken by the industry. The Refrigeration Research Foundation, Inc., founded and financed by members of the NARW, is not only beneficial to our industry, but equally so for our customers and their industry.

The job done in World War II has elevated the importance of the refrigerated warehouse as an important factor in the distribution of perishable food products.

During the next decade, I took for the refrigerated warehousing industry to further entrench itself as a service institution for the preservation of many new commodities and improved methods of handling products now in refrigerated storage.

H. C. HERSCHMAN
Terminal Warehouse of St. Joseph
St. Joseph, Mo.

THE refrigerated warehousing industry can well be proud of its growth and accomplishments since the beginning of the century. While there have not been many changes in the art of producing refrigeration, there have been improvements and modernization in design of the compressors, brine coolers, condensers, conversion from steam to electric power, etc. A number of steam driven compressors which were in operation in 1900 are efficiently operating today.

In the early 1900's refrigerated warehouses were insulated with sawdust, shavings or mineral wool and some are giving satisfactory service today. However the expense of operation of these steam plants and the plants with older insulation is generally higher than the cost of operation of the more modern constructed and better insulated buildings.

Fifty years ago most of the products then stored under refrigeration are the principal commodities handled today.

although the quantities were but small percentage of present day volume. The most marked increase of recent years has been in frozen fruits and vegetables. As early as 1900 we froze and successfully stored fresh strawberries in quart containers and corn on the cob for our personal use during the winter season. Commercial freezing of today's volume of fruits and vegetables was not then thought possible nor feasible.

We can remember when "Cold Storage" foods met considerable resistance in the mind of the consumer. Any food of doubtful quality was considered as having been in cold storage. The advent of quality packed frozen fruits and vegetables, poultry and meats, along with the modern refrigerator and household freezer have done much to change the attitude of the public toward refrigerated warehousing.

The trend of transporting perishables by truck instead of rail found many warehouses inconveniently designed to meet the new day requirement. One large warehouse I know of was erected during the first World War with track space for fifty carloads and not one place for a truck. Today a substantial percentage of its tonnage, both in and out, is by truck and has made it necessary to provide greatly increased truck facilities.

The application of refrigeration as it applies to the various commodities has been and is constantly under study, not only by the progressive warehousemen themselves, but through the Refrigeration Research Foundation. To meet the ever increasing cost of handling operations, many plants are using some mechanical handling equipment profitably. Due to the various temperatures, methods of freezing and piling requirements, design of plant, elevator limitations, etc., complete mechanization may not be practical.

G. D. Allman, President
United States Cold Storage Corp.
Chicago, Ill.

COLD Storage Warehouses in my section of the country are, for the most part, of the smaller type. We have none of the large in-transit houses so familiar in the east and middle west. Our business is, and always has been, an in and out proposition. When all is said and done, however, we probably have the same problems and see the same trends that the larger houses see and encounter. In years of service, I am young compared to some of those in the business, but in my few years, I have seen many changes occur.

One of the most significant trends in the refrigerated warehousing business, in my opinion, is our attitude toward and our interest in, our customers. And it is a good trend, good for ourselves and good for our customers. Well do I remember when I started in the business, that all we did was furnish the cold room for the holding of foods. We gave no thought to humidity, constant temperatures, proper packaging of the merchandise, efficient handling, prompt unloading of cars, or on the whole we had little interest in our customers except for the fact that he was the "guy" who mailed us his check on the first of the month. All we had was cold weather and it didn't seem to make much difference just how cold it was. But things are different now—yes, they are, thanks to an efficient Association, a few wide awake members, and the necessity forced upon us by our customers.

Another trend in our business is from cooler to freezer storage. In past years, warehouses were primarily for cooler storage, with a few freezers to take merchandise that was just about ready to spoil. There was, in the old days, a definite objection to "Cold Storage Foods." This was due in part to lack of education on the part of the public, and in part to our own lack of facilities and of our customers' willingness to freeze merchandise while it was fresh. Today, things are quite different. We have done a good job of education on frozen foods to the public, we are doing our part in seeing that a good job is done in freezing and handling of frozen foods. The packers of frozen foods are doing their part in seeing that foods are frozen fresh. The result is that today coolers are the small part of our business. Entire warehouses are being built for freezer merchandise alone. All of us have done conversion from cooler to freezer rooms.

One of the most important trends in our business in recent years has been the use of mechanized equipment in our warehouses. This has done much to aid us in lowering our costs of operation and to pass on lower storage rates to our customers. Too, in eliminating two handlings we can do a much better job for our customers. Handling tends to give us breakage and torn packages. Thus, the less handling we have to do, the better product we can give our customers from storage.

Last, but far from least, is the trend within ourselves. Today we have our customers' interests as our own. We are constantly trying to improve our methods to do a better job. We are supporting the Refrigeration Research Foundation to get the scientific know-how on doing a better job. We are supporting our Association to get the concrete foundations and the other fellow's experiences in aiding us to do a better job.

W. J. Amos, Jr.
Merchants Cold Storage Co.
Jacksonville, Fla.

AFTER thirty-one years in the business of operating a refrigerated warehouse, I believe the most significant trend has been in the type of warehouse construction. Originally it was believed that no refrigerated space was properly constructed unless within the walls, ceilings, and floors there was left a dead air space of from eight to twelve inches. Floor loads at that time were given little consideration and the load usually could not exceed two hundred fifty pounds per square foot. This was understandable because it was felt that with low ceilings with a maximum height between eight and nine and one-half feet were more economical as there was less space to refrigerate per square foot.

Insulation was a problem in those days and they found no way to erect corkboard, etc., without adjoining wood strips which caused a break in the insulation. It was the belief during these years that multi-storied refrigerated warehouses with a minimum of outside or exposed wall surface brought about far more economy.

Modern trends have brought a change. Now the dead air space is only that which is within the insulation and this allows for a more rigid construction and for more cubic footage of refrigerated space. Envelope type of construction has eliminated all breaks in insulation and also prevented break-down in the insulation after constructed thereby removing many of the former so-called headaches.

While the multi-story building was felt to be economical because of the minimum outside exposure and the great saving in real estate, in recent years labor has become such a dominant, costly item that the modern trend is toward one-story construction with high ceilings ranging in height from twelve to twenty-four feet which is suitable for palletizing and the use of forklift and other motorized equipment. With these one-story buildings which may hold an unlimited floor load, it is now felt that the economy of operation far exceeds former type of operation.

Charles M. Smith, President
Merchants Ice & Cold Storage Co.
San Antonio, Texas

Refrigerated Warehousing

Is Vital Link in Frozen Food Distribution

SINCE one of the fundamental ideas behind the freezing of foods is to increase the storage life of the fresh commodity, it can be seen that the refrigerated warehouse is indispensable in the marketing of frozen foods. The time spent in a warehouse by a frozen commodity is perhaps of longer duration than all the rest of the time from processor to consumer. Thus, the effect of storage on the quality of the product and on the cost of marketing is of extreme significance. Not only is it necessary that warehousemen furnish the proper storage conditions as regards temperature, humidity, and sanitation, but it is equally important that the facilities are structurally adapted and arranged geographically to promote the efficient flow of frozen foods from producer to consumer.

The present network of refrigerated warehouses, which spreads over the entire country, was for the most part in existence for some time before frozen foods became established as an integrated industry. How well this system of warehouses is arranged to serve its function in the distribution of frozen foods is frequently a subject of some controversy. But, at any rate, it is generally recognized that the effectiveness of warehousing will have a great effect in determining how fast the frozen-food industry will grow in the future.

The Function of the Warehouse in Frozen-Food Distribution

The refrigerated warehouse functions in two major capacities in the marketing of frozen foods. First, it serves as a facility for storing the frozen products from one producing season to the next, and second, it aids in their wholesale distribution.

Function as a storage facility. Refrigerated warehouses originally came into existence principally as a means of further lengthening the life of unfrozen perishable products. It was this use that brought about the initial growth of the industry shortly after the turn of the century. However, by the early 1920's the growth of warehouse space was exceeding the demand, and the industry was so overexpanded that many companies suffered serious financial difficulties. It was about this time that the freezing of foods was gathering momentum, and the storage of frozen products became the salvation of many in the industry.

In 1947, there were an estimated 1,781 warehouses in the United States, with an aggregate of over 675 million cubic feet of space. For the most part, these storage facilities were situated at points that were strategic in the commerce of perishable commodities, that is, at locations corresponding to areas of production, at in-transit points along the route from producer to consumer, and in the large metropolitan sections of the country.

As the storage of frozen perishables increased in volume, changes became necessary in some warehousing techniques. Scientists found that a temperature of zero degrees or lower is imperative for the long holding of most frozen products, that temperature fluctuations must be kept to a minimum, and that proper humidities need to be maintained. In many cases new handling methods and equipment were necessary because frozen foods were packaged differently from commodities previously stored in large quantities. Also, the storage life of most frozen foods is considerably longer than the fresh unfrozen product; therefore, the need for different consideration in this respect.

The growth of freezer space in refrigerated warehouses has been rapid since the introduction of frozen foods some 30 years ago. In 1949, refrigerated space held below 30 F. amounted to 40 per cent of all refrigerated space in all warehouses, as compared with 21 per cent in 1921 (See Fig. 1). The proportion of freezer space held below zero degrees had increased rapidly in the past 5 years. In 1947, it amounted to two-thirds of all freezer space.

In order to get a true picture of the storage of frozen foods, consideration must be given to the extent that freezer space in warehouses has been occupied. The mere existence of such space does not mean much unless it is known how completely it is filled with frozen foods dur-

A study of the facilities and methods used in the marketing of frozen foods has been made by the Marketing Facilities Branch of the U. S. Department of Agriculture and published recently under the title shown above. Information was gathered from many packers and warehouses. More than 315 wholesale distributors, 300 retail stores as well as many primary distributors, brokers and transportation agencies were visited in the survey and the resulting report gives extensive coverage of the subject with composite conclusions. This article is an extract from the warehouse section of the report.

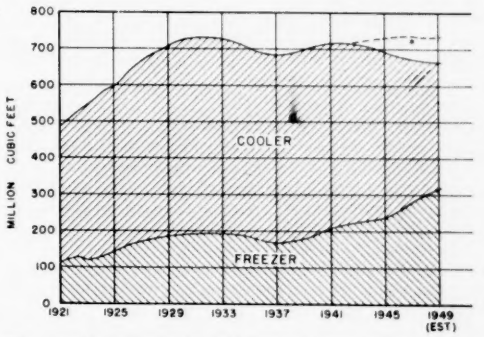


Fig. 1—Gross space in refrigerated warehouses, United States, 1921-49.
(Since 1943 cooler working rooms of meat-packing warehouses have been excluded as available storage space.)

From an extensive study and report of the same title published by the Marketing Facilities Branch, Production and Marketing Administration, U. S. Dept. of Agriculture. Prepared by J. Stanford Larson, James A. Mixon, E. Clinton Stokes.

ing their seasonal movement into and out of storage. Fig. 2 shows the quantity of each of the six principal freezer items held at temperatures of 29 F. or below in public refrigerated warehouses in the United States. This figure indicates the increase in volume of freezer stocks between 1921 and 1947. It should be noted that not all commodities in freezer storage are marketed as frozen foods. Items such as meat carcasses, cream, creamery butter, and lard are held frozen in storage but are thawed out and frequently further processed before being marketed. However, most of the foods held at temperatures below freezing are products that are delivered to users as frozen foods. This is true of all of the vegetables and fruits.

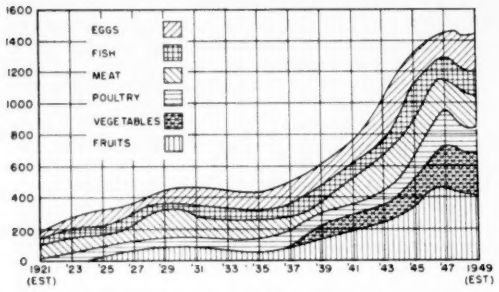


Fig. 2—Storage of six principal freezer items 1921-49.

Source: Information on fish compiled from reports from Fish and Wildlife Service, Department of the Interior.

Trade figures have indicated that during the 1920's and early 1930's freezer space was usually about 50 per cent occupied. In the few years prior to 1939, freezer occupancy averaged 60 per cent, but as a result of wartime conditions, by 1946 the occupancy reached 90 per cent, which is just about the maximum. During the 10-year period preceding 1940, holdings of the seven main freezer commodities increased 20 per cent by weight.

From the standpoint of increasing the efficiency of frozen-food distribution, there is a need to find the answer to some problems concerning warehouse location. For example, when additional storage facilities are needed, where are the best places to build them? In the producing area? In the in-transit area, or in the consuming area? A recent survey of frozen food distribution in the United States indicated that there was excessive moving of frozen foods into and out of storage. This extra movement of stocks could be partly due to the location of present warehouse facilities. In the event that additional warehouses are necessary in the light of a growing frozen-food industry, then it would be best to construct these facilities at geographical locations that would contribute most to the ease and economies of distribution.

The function of the warehouse as an aid to wholesale distributors. Many warehousemen rent refrigerated space to wholesalers for use as operational facilities. This space is used as working areas for the wholesalers to assemble and dispatch orders. Refrigerated rooms for short-term storage are also rented to the wholesaler for the holding of supplies from which he assembles his daily orders. Even a few of the wholesalers who operate from independent facilities are dependent on the nearby warehouse for refrigeration, which is piped into the operator's establishment from the warehouse plant.

In furnishing these facilities to distributors, warehousemen have been instrumental in fostering frozen-food expansion, for they have made it unnecessary for the frozen-food industry to be burdened during its experimentation

Modern break-up room in refrigerated warehouse for frozen food distributors.

stage with the expense of creating new operational facilities. Of course, the extent to which the wholesale distributor takes advantage of warehouse facilities is quite varied. Thirty-six per cent of the 315 frozen-food wholesalers covered in the recent survey use the warehouse almost entirely as an operational facility. Forty per cent of these distributors who operate from the warehouse also rent office space on warehouse premises (See Fig 3). In addition, 10 per cent of the distributors who operate from independent facilities rent warehouse storage space to supplement their own. Of course, whenever a wholesaler uses the warehouse, he pays in the form of rent and other fees. The condition under which he can best use the warehouse facilities or use his independent plant have become quite controversial. Certainly there are optimum conditions for each.

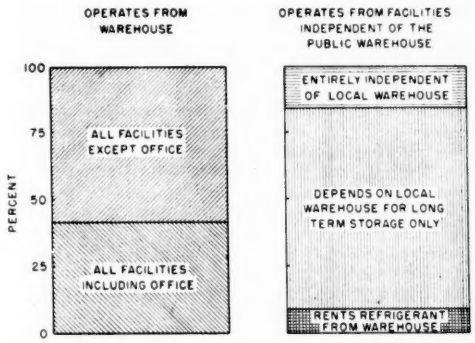


Fig. 3—Proportion of frozen food wholesalers who operate from public warehouses and use independent facilities.

The Flow of Frozen Foods through Refrigerated Warehouses

If foods were produced and frozen in the same general area where they are consumed, then the flow from producer to consumer would be greatly simplified. However, as things actually exist, the populous areas of consumption are, for the most part, widely separated from the areas where production is concentrated. A frozen-food distributor in New York City might receive frozen fish from Alaska, meat from Kansas City, poultry from Georgia, eggs from Arkansas, cherries from California, peas from New Jersey, and French fried potatoes from Maine. Such wide distances between areas of production and areas of distri-

bution make the flow of frozen foods through the marketing channels very complex, and as a result the location of refrigerated storage space plays a very important part in determining the extent and direction of the flow of frozen foods.

The Middle Atlantic and East North Central regions account for 50 per cent of the total freezer space, while the West North Central and Pacific regions, combined, account for 28 per cent. This leaves the other 5 geographic regions (30 States) with only 22 per cent of the Nation's sharp freezer space.

The three main reasons for storing frozen foods in a particular location are: (1) Holding either at the packer's private warehouse or at a public warehouse in areas of production preparatory to shipping; (2) holding at in-transit points for rerouting purposes; and (3) storing for distribution at terminal points (includes storage of small amounts in rural and rural-urban areas). Therefore, warehouse space exists in an area according to the importance of that area in food production, the nature of the area as an in-transit storage center, and the size of population.

The length of time that frozen foods are stored at warehouses in the packing, in-transit, and terminal areas depends mainly on the following factors:

1. *The amount of available zero storage space at the packer's warehouse as related to his volume of production.* Usually the limited storage space in a packing area makes it necessary for frozen foods to be shipped to in-transit or terminal warehouses as the packing operation progresses. Because of the reluctance of packers to build large storage facilities, they can only store small amounts of frozen foods. The short-term storage at the packer's warehouse is usually for that interval between the removal of the commodities from the freezer equipment and the loading out onto transportation facilities once the desired lots have been accumulated for shipment.

2. *Availability of space in in-transit and terminal warehouses.* If freezer storage space is filled to capacity at in-transit points and at terminal warehouses, then shipments from the packer warehouse will of necessity be delayed until appropriate space becomes available. For the most part, packers make arrangements in advance with warehouses for the storage of large quantities, but even the best planning cannot always assure the availability of storage space when and where needed.

In recent years, freezer storage space has been well filled during the fall months in many sections of the country. Although the shipment of frozen foods from packing plants has not been hampered very much by a scarcity of freezer space in areas where foods are destined for consumption or in-transit storage, the problem does call for careful consideration in future planning.

3. *Intensity of the demand for frozen foods.* Naturally, the factor of demand constitutes a continuous problem in the removal of frozen foods from the packer's premises and into storage warehouses along the marketing channel. Items with a strong demand will move without much difficulty through warehouse facilities and into the custody of the wholesale distributors at terminal distribution points, whereas, an item that becomes a "slow mover" on the retail market, can be expected to glut some storage facilities, and thus occupy space that could be used advantageously by items that are in high demand.

4. *Sales and purchasing policy of packers and distributors.* The sales policies of packers and the purchasing policies of distributors influence the location of storage stocks of frozen foods. For example, a packer may freeze foods for a distributor who will take possession of the merchandise upon the completion of the freezing operation. On the other hand, a packer-distributor may freeze foods and store them in a local warehouse and make shipments to consuming areas as needed.

In planning long-term storage for large quantities of frozen foods, first consideration should be given to the geographic location of the warehouse in respect to the producing areas and the areas of consumption to be served. Many frozen foods are today marketed from producer to wholesaler haphazardly through several different warehouses. An orderly system embodying the selection of a warehouse for long-term storage at a proper location could result in considerably less handling.

Commodities going to terminal areas frequently have to be reshipped at a later date to some other market, in order to satisfy demand at all points. Food stored at in-transit places are stored with the idea of taking advantage of the "through" freight rate and at the same time using the in-transit warehouses as a pivot point for assembling carloads of mixed frozen-food items to ship to distributors. Storing in in-transit warehouses usually affords the shipper greater flexibility because of the ease in diverting frozen-food shipments to any desirable place. Usually the closer this in-transit storage is done to the packer, the greater the flexibility, but due regard has to be given to the importance of using the warehouse as an assembly point for various items. When a distributor who operates several outlets gets his vegetables from one section of the country his fruits from another, and his poultry and fish from still another, it is desirable to assemble them some place in mixed loads for further distribution. Under such conditions the selection of a warehouse becomes a matter of making the most suitable choice to fit the particular situation. The selection of a centralized storage point by a company with several wholesale outlets could mean the elimination of much cross-handling caused by local shortages and surpluses.

Although in the past, storage facilities were constructed primarily in the areas of consumption, in more recent years the trend has been toward construction in the producing and in-transit areas. In this respect, the Pacific region, which is a prominent producer of frozen fruits and vegetables, had the greatest increase of freezer space over the 9-year period, 1939-47.

The warehouses that have been construucted in recent years seem to have gained several economic advantages over established warehouses. Two of these advantages are: (1) Using modern construction methods and designs which permit installation and use of improved handling equipment; (2) in the case of in-transit warehouses, building them at points which give them greatest advantages in handling.

Seasonal Movement of Frozen Foods Through Warehouse Storage

Since frozen-food production is essentially seasonal, it is only natural that the stocks of any one commodity are highest when the producing season for that commodity is near completion and are lowest just before the next harvest season arrives. As the producing season varies from one product to the other so does the into-storage and out-of-storage movement. However, it can generally be said that the heaviest in-movement of fruits, vegetables, eggs, and fish occurs in the spring and summer and the heaviest in-movement of meats and poultry occurs in the fall and winter. The peak and low holdings of the total of all freezer items vary slightly from year to year but the in-movement usually begins in May or June and the out-movements in September or October (fig. 4). In 1947, at the termination of the general into-storage movement, the total amount of frozen foods (the seven main freezer

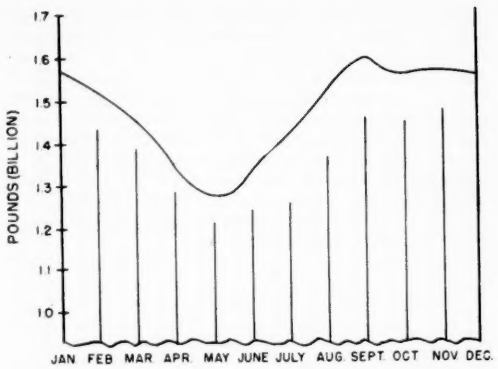


Fig. 4—Volume by weight of 7 main freezer commodities in storage each month, 5-year average 1944-48 (Includes fruits, vegetables, poultry, eggs, meat, dairy products (cream and butter), and fish). Source: Figures for fish taken from Frozen Fish Reports, Fish and Wildlife Service, Department of the Interior.

items) totaled 1.6 billion pounds. When stocks were lowest they totaled 1.3 billion pounds.

Seven Freezer Items

The storage of seven main freezer items had the following relationship when stocks were highest in 1947:

Product	Per Cent	Product	Per Cent
Fruits	25.0	Eggs	11.7
Vegetables	21.4	Meat	10.2
Poultry	17.1	Fish	7.4
		Dairy	7.2

As the general out-movement of freezer stocks terminated in 1947, and stocks were lowest, the following relationship existed between products:

Product	Per Cent	Product	Per Cent
Meat	25.8	Poultry	15.1
Fruits	23.2	Eggs	11.1
Vegetables	17.9	Fish	5.1
		Dairy	1.8

In order to assure a continuous supply of frozen commodities on the market, some carry-over from year to year is desirable, but because of definite limits to the storage life of most frozen products, it is very important that these foods are put into consumer channels before their maximum storage time is reached and quality begins to drop. In years when carry-over stocks are excessive the foods are moved into the market by a downward pricing policy. If the effort of moving surplus stocks allows the products to go beyond their ordinary storage life, then the problem not only becomes magnified many times but the movement of low quality merchandise on the market hurts the salability of the new pack.

Frozen fruits. The low in freezer holdings of fruits, reported at 278 million pounds in 1946 and 318 million pounds in 1947, usually occurs in June, which is about the time of the year that the over-all fruit-packing season is gathering momentum. The peak storage occurs almost every year in November and in 1947 there were 406 million pounds stored in that month. Except for berries, which are frozen mainly between January and May, storage holdings in June indicate the amount of fruits carried over from the previous year's pack. The storage figures over the past few years reveal that the percentage of frozen fruits stored in packing areas is somewhat greater during the peak storage period than at the low storage point.

Frozen vegetables. The seasonal storage of frozen vegetables follows the same general fluctuations as frozen fruits. The low usually occurs somewhere between May and June and the peak sometime from October to December. In 1947, the low storage occurred in June and amounted to 231 million pounds. The peak was in October, when there were 353 million pounds in storage. The in-movement of vegetables differs somewhat from fruits in that several important vegetables, such as broccoli and cauliflower, are produced in the winter, whereas, about the only important winter production of fruits is citrus.

Frozen poultry. The low storage for frozen poultry usually exists in June, July, or August, and amounts to downward of 175 million pounds. The peak storage point occurs in December, January, or February, with upward of 275 million pounds being held. The initial into-storage movement begins with broilers in May, fryers in September, roasters in September and October, fowl in October, and turkeys in November. Of course, some of these birds held in freezer storage are of the New York dressed (or hard chilled) type. In fact, only a small part of the frozen poultry reported in storage is sold eventually as frozen packaged poultry. The extent as well as the initial date of the into-storage movement varies with the geographical regions of production. These production regions are widely distributed throughout the United States. The heaviest production is in the North Central regions. Storage volume is also large in these regions, but a large amount of the frozen poultry is shipped out during the early part of the heavy producing season for storage in the areas of consumption.

Frozen meats. A very small amount of meat in freezer storage is marketed in prepackaged frozen form. Most of the stocks consist of carcasses and meat parts that are stored for use during periods of shortage or for reasons of monetary speculation. Although the seasonal movement of meats marketed to consumers and restaurants in the frozen state does not necessarily follow a definite pattern, the 1944-48 average showed a range in the amounts in all frozen meats stored in warehouses from a low of 204 million pounds in November to a high of 426 million pounds in March. Of these amounts, beef and pork constituted about 90 percent. The remaining 10 per cent consisted mostly of lamb, mutton, and veal.

Frozen fishery products. Although frozen fishery products are coming into storage the year around, the low in storage stocks is usually reached in April or May and the high in December. In 1948, the low holdings amounted to 68 million pounds while the peak was 158 million pounds. Most of the total fishery products in storage are marketed in the frozen form.

Frozen eggs. Frozen eggs usually start an into-storage movement in the early spring, reach the annual peak, and start their out-movement in midsummer. According to the 1944-48 average, the annual low in storage was 86 million pounds and occurred in March; the peak storage was 293 million pounds and occurred in August. There is no significant difference in the percentage stored in the producing area during the production season as compared with the nonproduction season.

Frozen dairy products. Creamery butter and plastic and fluid cream have an into-storage movement beginning in the late spring and reaching a peak in the late summer or early fall. The 1943-47 monthly average for creamery butter showed a low of 30 million pounds in April and a high of 150 million pounds in September. By the same token, the storage of frozen cream, both plastic and fluid, amounted to 12 million pounds in April, the low month,

and 60 million pounds in September, the high storage month. These figures do not include the small amount of ice cream that is held in general storage in public refrigerated warehouses.

Frozen specialty items. Frozen specialty items refer mainly to precooked and prepared dishes, such as frozen meals, frozen french-fried potatoes, and frozen uncooked pies and cakes. There are no data available that show the seasonal storage movement of these specialty items, but the nature of the production of most of them would indicate no special pattern of movement.

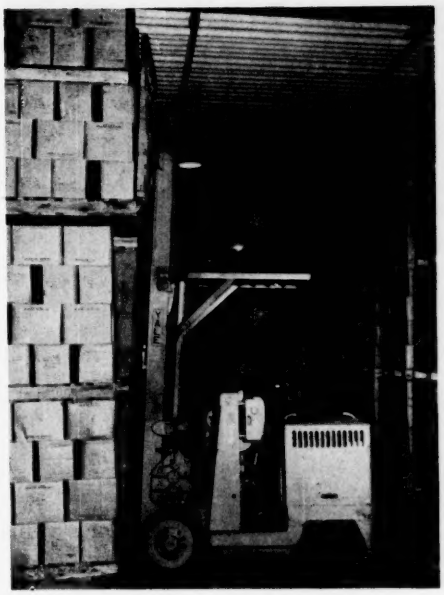
Storage in Public and Private Warehouses

About 85 per cent of the long-term storage of frozen foods is done in public refrigerated warehouses. Although only a few packers and distributors have gone into long-term warehousing, more and more of these firms are increasing the amount of short-term storage facilities they have at their plants. A number of small packers have to rely entirely on public warehouses for freezing as well as storing. Similarly there are packers who have freezing facilities at their plants, but their short-term storage space is so limited that the frozen product has to be taken to the local public warehouse when it is removed from the freezing equipment.

The volume of business of frozen-food wholesale distributors, in most cases, has not been large enough to justify maintaining a facility to take care of all their storage. Although many distributors use private space for short-term storage, there are only a few who use private space for long-term storage. The survey of 315 wholesalers which was conducted in 1947-48, showed that 84 per cent of them are dependent on the public warehouse for long-term storage.

Handling Frozen Food at the Refrigerated Warehouse

Importance of efficient handling. The fact that there is a relatively high fee for moving frozen foods into and out of storage is indicative of the importance of efficient handling. The movement of a unit load of frozen foods to and from a pile in storage and to and from the loading platform constitutes an operation that if inefficiently done can add materially to the marketing cost of the products. It seems a simple matter to unload a rail car or truck, convey the frozen foods to a pile in storage, and later return them to the loading zone for hauling away in a vehicle. And if all the factors involved are favorable to efficient operation, the movement of the foods can be almost as simple as it seems.



This electric fork truck is being used to place a two-pallet load of frozen fish fillets on top.

But in most warehouses throughout the country, the conditions are not ideal for handling frozen foods, and the problem becomes one of using the best-known practices to suit the particular situation. Most of the warehouses in

Advantages of Long Term Storage in Various Type Warehouses

Some of the advantages of long-term storage in public warehouses are listed below:

1.—Storage space exists in large amounts especially in important consumer and in-transit areas.

2.—The operation of refrigerated warehouses requires a special skill and through many years of operation most public warehousemen have acquired valuable experience.

3.—The public refrigerated warehouse is an established institution embedded in the routine channel of marketing perishables.

4.—It is usually easier for the owner of the foods to borrow money on commodities in storage.

5.—The public warehouseman is not limited to storing frozen foods; therefore, he is in a position to have a high degree of space occupancy the year round.

Following are some of the advantages of long-term storage in packers' warehouses:

1.—Affords the packers an opportunity to exercise closer supervision of storage methods and other storage conditions that affect the quality of products.

2.—Offers the packers longer direct control of goods for advantage in market price.

3.—Because a private warehouse assures the packer of a definite amount of storage space, he will be in a good position to plan his operations on the basis of orders for "future" deliveries.

4.—In many cases, storing at a packer's warehouse can shorten the marketing channel by enabling shipments to be made directly from the packer to the distributor's terminal warehouse.

Long-term storage at the wholesalers' private warehouses have advantages as indicated below:

1.—The distributor can exercise close supervision of the storage of his own produuct.

2.—Such storage allows for greater control over the inventory of goods, which in turn offers more flexibility in ordering from packers and brokers and taking orders from customers.

3.—It permits self-performance of services desired by the customer such as recoopering, inspection, and sampling.

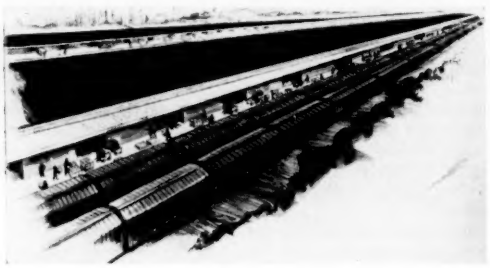
4.—The distributor can arrange the facilities so as to realize maximum handling efficiency.

5.—It reduces the amount of handling required by decreasing the number of facilities through which the product must pass.

the country were built prior to the commercial freezing of foods on a large scale, and the conditions under which they operated at that time called for different techniques than are necessary today. New and improved equipment has been developed that operates quite efficiently in new warehouses but is not adapted to efficient operation in many of the older warehouses.

In moving frozen foods into and out of the warehouse storage room, the objective is to complete the operation in the least possible time and to do it at as low a cost as possible. Some of the factors that influence the length of time that the products are out of refrigeration and that affect the efficiency of the operation are: (1) Warehouse design; (2) adaptability of equipment; (3) methods of piling and unpiling; and (4) withdrawal procedures.

Warehouse design.—Warehouses are generally classified as to design according to whether they are single story or multiple story. Most of the larger warehouses in operation today are of the multiple-story design, but in recent years several large single-story warehouses have been constructed. Although advantages and disadvantages of each are subjects of wide controversy, the main advantage of the multiple-story warehouse is that it occupies less ground space, and this is a big factor in metropolitan areas where real estate values are high. The principal advantage of the single-story warehouse perhaps lies in its adaptability to the use of modern handling methods and thus provides an opportunity for high efficiency in handling frozen foods into and out of storage.



Loading platform on railroad siding for modern warehouse

Warehouses that are so designed as to have inadequate space at the loading dock for unloading or loading rail cars and trucks are likely to find that congestion at certain hours of operation causes inefficient use of labor and equipment. Also, the location of loading zones in relation to the storage rooms can be cause for cumbersome handling in moving merchandise.

Withdrawal procedures. — The methods and equipment used for handling frozen foods at the refrigerated warehouse vary according to the procedure used for withdrawing the frozen foods from storage. Merchandise stored in a packer's or intransit warehouse is usually withdrawn from storage in large quantities. Therefore, the requirement for loading out a rail car or a trailer truck is different than when the withdrawal is made in smaller quantities, as they often are at terminal warehouses in the consuming areas. When frozen foods are withdrawn from storage in carlot quantities, the operation can usually be planned well ahead of time, and thus efficient use of available facilities and personnel can be realized.

At a warehouse such as those at terminal points where withdrawals are made on short notice and the loading of trucks is usually concentrated during a short period of a few hours in the morning, the handling problem becomes quite different. Frequently mechanized equipment suited for handling large quantities of frozen foods at one time would be uneconomical for use in shuttling back and forth to the storage room to pick up only a few packages of frozen foods each trip. The withdrawal procedure in such instances might even call for the removal of only one or two packages from each of several different stacks.

Withdrawals at some warehouses are so heavy during certain times of the day that it is difficult to coincide the arrival of merchandise on the loading dock with the arrival of the vehicle that is to carry it away. Sometimes trucks have to wait on frozen foods to be brought out of storage and at other times the frozen foods have to be brought down well in advance of the arrival of the truck. Frozen foods that stand for long periods on unrefrigerated platforms are likely to have unfavorable changes in quality.

Kinds of Frozen Foods Distributed

Although most frozen-food wholesalers who distribute their products to the retail trade handle each of the principal commodities that are frozen, there are many wholesalers serving the institutional and industrial trades who handle only a few selected items. For example, a caterer to bakeries will often handle only fruits or eggs. Likewise, a poultry wholesaler might handle frozen poultry and not sell other frozen foods. Of the wholesalers interviewed, 92 per cent reported distributing frozen fruit, 90 per cent vegetables, 62 per cent poultry, and 61 per cent fish. Frozen meats, frozen pre-cooked foods, and specialty items, although sold by quite a few regular wholesalers, are often sold in large cities by local concerns that prepare these items in specialized kitchens. Most frozen eggs are sold by wholesalers who specialize in this product and who cater to the institutional and industrial trades.

There are many wholesalers who are agents for distributing the merchandise of a packer distributor or a prime distributor. For the most part these wholesale firms are independent concerns that have working agreements to handle a distributor's merchandise exclusively in an area. Since the primary and packer distributors often have a choice as to who is to handle their product, their policies are instrumental in determining the wholesaler they select. In the survey, almost one-half of the agent wholesalers were operating in public warehouses as compared with about one-fourth of the independent wholesalers.

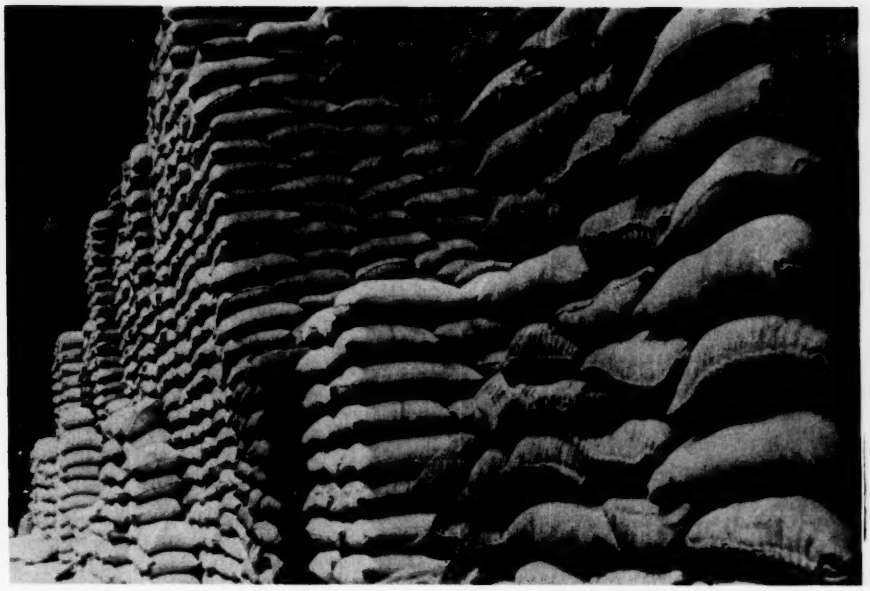
Frozen Food Statistics Given in New Government Publication

STATISTICS of value to frozen food packers and distributors are included in a new volume on domestic food consumption prepared by the Bureau of Agricultural Economics of the U. S. Department of Agriculture. Entitled "Consumption of Food in the United States, 1909-48," the publication is largely a collection of tables and charts showing trends in the nation's eating habits and changes in per capita use of various foods since the early 1900's.

Of particular interest to the frozen food industry is a series of tables covering frozen fruits and vegetables. Because of the relative newness of the frozen food field, statistics in these categories go back no farther than 1925. Two tables on frozen fruits show (1) supply and distribution from 1925 through 1948, and (2) per capita consumption over the same period. Two tables on frozen vegetables indicate supply and distribution from 1937 through 1948 and per capita consumption in those same years.

The study was prepared as part of a project under the Federal Research and Marketing Act. It is known technically as Miscellaneous Publication No. 691.

Refrigeration Protects Aroma and Flavor



(Photo courtesy Pan-American Coffee Bureau, New York, N. Y.)

The conventional method of storing green coffee in unrefrigerated warehouses.

The Refrigerated Storage of Green and Roasted Coffee

By Clarence E. Baker

Purdue University Agricultural Experiment Station

ONE of the most interesting recent developments in the food handling industries is the growing appreciation of the value of refrigeration. As economic competition increases and the margin of profit is reduced, concerns which wish to stay in business must cut production costs, improve the quality of the product, or both. Some industries that are following patterns of operation established many years ago, only now are coming to realize that refrigeration may have an important role in improving the quality of their products and in the elimination of deterioration and waste.

Progressive members of the coffee trade are moving forward to meet economic competition by modernizing their handling and processing methods through the use of the modern facilities now available to them. Commercially, green coffee is processed, packed in bags and stored inland in the countries in which it is grown. When sold the coffee is delivered to the seaport for export. New York, New Orleans and San Francisco are the largest coffee receiving ports in the United States. In these cities, and in the warehouses of roasting plants across the country, the green coffee beans are held for an additional period before roast-

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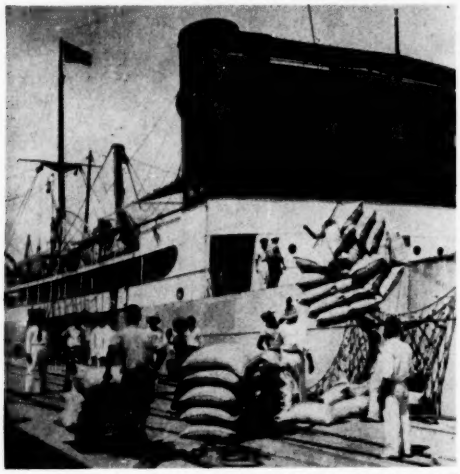
ing. The length of time between harvest and roasting varies with the season of the year, the country in which the coffee beans are grown, market demands and many other factors. Blends of green coffees from different sources usually are made just before roasting to secure the qualities most desired by American coffee lovers.



(Photo courtesy Pan-American Coffee Bureau, New York, N. Y.)

Loading green coffee aboard ship for transportation to the United States.

The prevailing practice in coffee growing countries has been to hold green coffee in "dry" storage, usually in ventilated sheds or warehouses, sometimes in poorly ventilated buildings. Even after the green coffee reaches the United States similar handling practices are followed. This means that between the time the green coffee is ready for shipment and the time the blends are roasted it is subjected to great variations in temperature, moisture and other factors. The unfavorable effects of these treatments upon the finished product that reaches the tables of America as beverage coffee are now being realized.

Refrigeration Requirements of Coffee Not Established

Several coffee importers and roasters, together with warehouse operators, wishing to explore the possibilities of refrigeration, recently consulted The Refrigeration Research Foundation to obtain information on handling practices and optimum storage conditions. Very little information was available, however, as refrigeration of coffee had been practiced to but a limited extent. Definite handling practices have not been established and the benefit to be expected from refrigeration of green or roasted coffee was not definitely known.

To obtain information on these questions, experiments were set up under the auspices of The Refrigeration Research Foundation through a Short Term Investigation Project at Purdue University Agricultural Experiment Station. The results of these early studies are most encouraging.

Toledo Experiments

Through the combined interest of a warehouse operator and a coffee merchandizing organization a comprehensive series of experiments to determine the value of refrigeration in the storage of green and roasted coffee was started at Toledo, Ohio in the summer of 1948.

The Woolson Spice Co., roasters and packers of several blends of high grade coffee, furnished the green coffee, made the experimental roasts and packs, cup tested the coffees after different intervals of storage and set forth the results of the tests. Their dry storage warehouse facilities also were used for holding the control samples of green coffee that were stored without refrigeration. The method of handling green coffee at this plant is typical of that followed by coffee roasters in all parts of the United States.

The Great Lakes Terminal Warehouse Co. provided storage space under the various conditions of refrigeration, handled the green and roasted coffee during the holding periods, and secured weights of the coffee beans entering and leaving the warehouse.

The author, representing The Refrigeration Research Foundation, assisted with planning the experiments, observed the testing of the samples, conducted laboratory tests at Purdue University on moisture gain and loss, and summarized the results.

In the original experiments nine weighed bags of medium high grade Santos (Brazilian) green coffee, nine bags old crop Santos, and nine bags of fancy washed Mexican green coffee were stored in a cooler room (32-36 F., 65-70% Relative Humidity) at Great Lakes Terminal Warehouse, July 2, 1948. Nine bags of each of the above green coffees were stored at the same time in the dry storage warehouse of the Woolson Spice Co. plant.

Three bags of each grade of coffee were removed from each storage after 75, 143 and 208 days, weighed and taken to the Woolson Spice Co. laboratories, where the color of the green coffees from the refrigerated storage and the unrefrigerated warehouse was examined and compared. The coffee from each three-bag lot was then roasted separately under uniform conditions of time and temperature and color comparisons were made of the different roasts. Cup tests of the freshly roasted coffees also were conducted in the manner followed by the coffee industry, by an expert in that field.

Following each removal from both cooler and dry storage, samples of roasted whole bean and ground roast of each of the two Santos and one Mexican coffees were packed. The experimental lots consisted of three one-pound paper bags, whole bean; three one pound paper bags, drip grind; three one-pound vacuum cans, whole bean and three one-pound vacuum tins, drip grind from each of the three grades of coffee from the refrigerated storage and from each of the three coffees from the dry storage. Duplicate lots were stored under three conditions: (a) cooler refrigeration (32-36 F., 65-70% R. H.), (b) freezer storage (-3 to 1 F), (c) room temperature (laboratory Woolson Spice Co.). One package of each set of samples was removed from its respective storage condition at approximately 60 day intervals, examined and cup tested in the Woolson laboratory after being held there for 24 hours.

Rather than attempting to describe or tabulate in detail the findings of this complicated series of tests, the results will be summarized so that they may be more easily assimilated.

Color and Quality of High Grade Green Coffee Maintained by Refrigeration

The beneficial effect on the preservation of the fresh appearance and the original attractive green color of the coffee beans stored under refrigeration, especially in the case of the high grade Mexican washed coffee, was quite outstanding. Little difference was observed in the two

grades of Brazilian coffees between the lots stored under refrigeration and those held in dry storage until the latter part of the storage period, or after about 200 days in storage. The better grade Santos coffee held in dry storage had by that time shown marked loss of color and fading in comparison with the lot of the same green coffee held under refrigeration.

The beneficial effect of refrigeration on color of the green Mexican washed coffee became more pronounced with each removal. The coffee held in dry storage became more faded, gray and dull appearing with length of time in storage. The lots removed after 143 and 208 days in dry storage were progressively less attractive in appearance than the lot removed after 75 days, which showed marked loss of color in comparison with the coffee stored under refrigeration. The Mexican washed coffee held in cooler storage remained bright green and attractive during the entire storage period of approximately seven months. At the end of this period it was considered to have retained to a high degree its original color and characteristics that distinguish it as a high grade coffee.

Effect of Refrigeration on Color and Cupping Quality of Freshly Roasted Coffee

It also is interesting that the improved color and appearance of the green Mexican washed coffee stored under refrigeration was carried over into the roasted product. The beans from the refrigerated lots produced a roast of a brighter, more attractive color than the same coffee held in dry storage. Cup quality tests showed that the coffee from refrigerated beans had more "snap" and better aroma and flavor, indicating that the refrigerated green coffee had retained more of its original characteristics than that held in dry storage. Later removals showed greater differences in favor of the refrigerated coffees than was evident after the first 75 day period. With high grade coffees this increase in color and quality retention as a result of storing the green coffee under refrigeration is of considerable value.

In the case of either of the two Brazilian green coffees, no important differences were found in the appearance of the roast or in their cupping quality, between the lots stored with or without refrigeration. With these less costly grades the expense of refrigeration probably would not be justified from the standpoint of its effect upon quality or appearance alone. Refrigeration might prove to be profitable, however, for the purpose of protecting even the cheaper grades of green coffee from excessive moisture, mold, insect or rodent infestation, or other hazards of present practices. During the currently prevailing high prices, at least, it is likely that refrigeration of the better grade Santos coffees to be held for an extended period would be profitable from the standpoint of quality retention.

Repetition of Experiments Give Similar Results

In order to determine if the beneficial effects from refrigeration just described could be duplicated with other crops of Mexican washed coffee, shipped and stored at a different season of the year, a second series of samples of newly received coffee was stored on January 13, 1949. Nine bags were placed under cooler refrigeration at Great Lakes Terminal Warehouse and nine bags were held in dry storage at the Woolson Spice Co. Three bags were removed from each storage on March 29, May 19, and July 28, 1949. Color comparisons of the green coffees, color studies and cup quality tests of the roasts were made as before.

The results of this second series of tests confirmed the original findings to the effect that Mexican washed coffee stored under cooler refrigeration retained its attractive green color to a much greater degree than when held under the customary manner in dry storage, with fluctuating temperature and moisture conditions. This favorably influenced the color of the roast and was reflected in better cup quality in comparison with lots of the same coffee held for equal periods in dry storage.

The Economic Importance of These Studies to the Coffee Industry

The value of the results of these studies on the refrigeration of green and roasted coffee from the standpoint of a coffee expert is stated as follows by Ralph F. Brucksieker.

"These studies indicate that storing Mexican, Central American, Columbian or other high grade green coffees under refrigeration during the spring, summer and early fall months would be economically practical under many conditions. Roasters of high grade blends would be glad to pay a premium to secure greater retention of the original color, cup character and general cup quality that give these types of coffee their desirable characteristics. The prevention of shrinkage which often takes place in "dry" storage is a further consideration.

"Coffee roasters located in large cities, who distribute their output through various branches, could protect their product against loss of quality by holding reserve stocks in freezer storage until actual distribution. This would be especially true with coffee packed in paper bags. Coffee so packed deteriorates rapidly at higher temperatures. The present economic trend toward increasingly greater use of paper bags emphasizes the importance of this consideration.

"Wholesale grocers or chain store operators who take advantage of a favorable market situation to buy supplies of roasted coffee in excess of their normal requirements may protect both their investment and the quality of their merchandise by placing the surplus in freezer storage until needed.

"In the home, opened vacuum tins of coffee should be kept in the refrigerator for retention of optimum quality. Coffee purchased in paper bags will better retain its original quality if placed in tightly closed glass containers and held in the refrigerator".

The Effect of Refrigeration on Whole Bean and Ground Roasted Coffee in Paper Bags and Vacuum Cans

Studies of the effect of storage conditions on packaged coffee also established some interesting relationships. As one would expect, the package, either paper bags or vacuum cans, in which the coffee was held and whether the coffee beans were whole or ground also were factors related to the time roasted coffee would retain its original quality under different conditions. The paper bags used in these studies were one-pound, glassine lined, made from a type of paper known as White P.K. The same general type of bag is used throughout the industry.

Coffee in Paper Bags: Both grades of roasted whole bean Santos coffee, from refrigerated and from dry storage held in one-pound paper bags at room temperature, developed a small amount of rancidity and staleness by the end of

a two month period. The same whole bean coffees held in cooler storage were judged to be fairly fresh but with slight deterioration in quality after the same length of time. The series stored at freezer temperatures was reported as very reasonably fresh, indicating little change in their original quality during this period when held frozen.

The same two grades of Santos coffee ground, stored under the above conditions, were of slightly lower quality in every case than the whole bean samples. This shows that the ground Santos coffees deteriorate a little more rapidly than the whole bean form under any of the three holding conditions. The greatest difference between the deterioration of the ground coffee in comparison with the whole beans occurred at room temperature; the least difference was found in the frozen coffee.

The Mexican washed coffee kept better under all of the above conditions than the Santos coffees. Both the whole bean and ground Mexican coffee from cooler storage packed in paper bags kept in excellent condition in the freezer storage. That stored in the cooler was considered to have lost only a small amount of its original "snap" and quality. At room temperature both the ground and whole bean coffee was classified as slightly stale and slightly flat, but with less loss in quality than that suffered by both the ground and the whole bean Santos coffees under the same storage conditions. The high-grade Mexican coffee appeared to be able to maintain its original quality to a greater extent under adverse conditions than did either of the two grades of Santos coffee.

Coffee in Vacuum Packed Cans: Coffee is vacuum packed to prevent or retard a change in flavor resulting from oxidation of the oils. Up to 90 per cent of the oxygen that would normally be present in the can is removed during the packing process and a vacuum is produced within the can.

After roasting, and especially after the roasted coffee is ground, a gas, mostly CO_2, is given off. The amount of gas formed varies with the type of coffee and roast. Thus, after a can of coffee has been evacuated the gas which escapes gradually from the ground beans may reduce a portion or all of this vacuum, or perhaps even develop a pressure within the can. The ultimate pressure is attained after about seven or eight weeks, depending on the type of roast, the fineness of the grind and other factors. In the case of some coffees that give off large amounts of this gas it is necessary to permit them to stand for a time after roasting and grinding to permit the escape of some of the CO_2 before the coffee is vacuum packed. If such coffee is packed immediately after roasting excessive pressure may develop within the can, causing it to bulge.

Whole bean and ground vacuum packed coffees also responded to storage under refrigeration in the Toledo experiments. Both the Mexican and the two grades of Santos coffee in cans, held at laboratory temperatures, lost considerable quality during the holding period, as revealed by cup quality tests. This was true both in the case of the whole bean and the ground coffee. The greatest loss of original quality was with the Santos coffees.

The quality of the brew from the vacuum packed Santos coffees stored at cooler temperatures was much better than the same vacuum packed coffee held at room temperature. Some loss of quality was found. The ground form has lost a somewhat greater amount of its original characteristics than the whole bean form.

In freezer storage vacuum tins of both grades of Santos and the high grade Mexican washed coffee responded about equally in the retention of their original characteristics. In the case of all three coffees, that in vacuum packed tins in freezer storage lost very little quality during a 90 day period of storage. The loss of quality of ground coffees was considered to be slightly more than in the whole bean samples of each particular coffee even when vacuum packed.

The effect of low temperatures on the loss or retention of vacuum, likewise, was interesting. At room temperature all vacuum packed tins lost all their vacuum and developed pressure. In cooler storage the cans of Santos coffees retained a vacuum of 2 to 5 inches for 68 and 65 day periods. A 4-6-inch vacuum was retained in freezer storage.

The Mexican coffee, on the other hand, lost all of the original vacuum and developed pressure regardless of the storage condition. The amount of pressure was not accurately determined, but it was estimated to be about 2 pounds in all cases. This coffee is one of the types which has a tendency to produce a comparatively large amount of CO_2. The formation of pressure within the can is not an undesirable condition but rather a natural characteristic of many high grade coffees. None of the cans were bulged or showed other evidence of excessive pressure.

Moisture Absorption by Roasted Coffee Under Refrigeration

During the examination of the ground roasted coffees stored in paper bags in the Toledo experiments, the coffee held in cooler storage appeared to absorb moisture and that stored frozen semed to become slightly dehydrated. As no weights of sufficient accuracy to measure these changes had been made, moisture changes could be determined only by observation and "feel".

To explore this question a little more thoroughly accurately weighed duplicate samples of ground and whole bean fancy Mexican washed coffee were stored under cooler and freezer conditions in the horticultural laboratories at Purdue University. After 34, 68 and 166 days net weights of the coffee were again made and the amount of moisture absorbed during each interval and over the whole period was determined. After the final weighing on July 12, 1949, the samples were removed from storage, placed at room temperature and reweighed after 24 hours, then shipped to the Woolson Spice Co. for cup testing.

The cooler storage temperature carried during these tests was 34 to 36 F. and the relative humidity ranged betwen 85 and 90 per cent. The freezer storage temperature was 0° to -5 F. and the relative humidity, as determined by a Serdex Model 201 registering instrument, was 68-70 per cent.

In cooler storage the ground coffee absorbed approximately 6 per cent moisture after 34 days; 9 per cent after 68 days and 15.5 per cent after 166 days. The whole bean coffee absorbed approximately 4, 8 and 15 per cent during the same intervals. After 24 hours at room temperature, following removal from the cooler, the ground coffee lost 2.6 per cent of its removal weight and the whole bean coffee lost 2.3 per cent.

The ground coffee in the freezer storage gained 1.6 per cent of its original net weight after 34 days; 2.9 per cent after 68 days and 3.8 per cent after 166 days. The whole bean coffee gained .75, 1.4, and 2.0 per cent during the same periods. After 24 hours at room temperature the ground coffee increased in weight to the extent of approximately 1.0 per cent of its removal weight and the whole bean coffee gained essentially the same amount. These gains in weight probably resulted from condensation of moisture from the surrounding air on the cold coffee.

In making the net weight determinations the bags were not opened but a coffee bag of the same original weight, subjected to the same conditions was placed in the weight

pan of the balances. Weighings were made in the storage rooms, with the obvious exceptions of those made after 24 hours.

These studies indicate a considerable moisture pick up for both ground and whole bean coffee in paper bags held in cooler storage with a high relative humidity. The 85-90 per cent range used in these studies was undoubtedly too high and considerably higher than that prevailing in the cooler of the storage in Toledo, which was dehumidified to a more satisfactory range. The optimum relative humidity requirements, while not definitely determined are assumed to be in the range of 60-65 per cent, or at a level where little moisture is absorbed or lost. Under the conditions of these tests there was no dehydration of either the whole bean or ground coffee stored frozen.

The Effect of Storage Conditions on Weight Retention in Green Coffees

Each bag of experimental green coffee was carefully weighed as it entered the Toledo storages and again as it was removed, to determine the gain or loss in weight. With the coffee held in cooler storage the removal weight was taken immediately outside the cooler room door, to avoid possible errors from surface condensation.

The average gain or loss in weight of each three-bag-lot of green coffee upon removal from storage is shown in Table I. The coffee stored in July 1948 and held through the late summer, fall, and early winter months, shows a small but consistent gain in weight for the lots held in cooler storage and a somewhat greater loss for the lots held in dry storage. The net gain in favor of the lots held under refrigeration varied from 2 to 3.5 per cent of the original gross weight of the bagged coffee.

The second series of bags of Mexican washed coffee stored in January, 1949, and held through the spring and summer months showed no appreciable difference in favor of the refrigerated storage. During this period of the year "dry" storage conditions, such as those prevailing in the Woolson warehouse, would evperience a higher relative humidity than during the winter months when heat is used. The prevailing relative humidity in the Toledo area during the spring and summer of 1949 was higher than normal. The green coffee carried in dry storage, therefore, did not show as much shrinkage as took place in the first series of tests.

Kansas City Experiments

The results of the green coffee refrigeration studies at Toledo were further supported by a series of tests conducted at Kansas City, Missouri through the cooperation of a nationally known coffee packing company and the local United States Cold Storage Company warehouse.

This coffee roaster packs a high quality blend composed chiefly of a number of Central American and Mexican coffees with a low proportion of Brazilian beans. The small amount of Santos coffee used is never stored for long periods, but is received at the plant at about the rate it is required. The more expensive coffees are shipped to this country in large quantities and stored. Shipments arriving during February, March and April often are held until October, November, or December. This means that these coffees may be held for seven or eight months during the warmest part of the year. Only this one blend is packed by this company and much effort is expended in maintaining a uniformly high quality year after year.

The green coffees used in these tests were two fancy high-grown Guatemalas, one a Hardbean and the other a Strictly Hardbean. At the time the shipment was received experimental lots of each of the two green coffees were placed under cooler and freezer refrigeration. The remainder of each coffee was held in dry storage; the bulk of the shipment in the customary manner, another experimental lot in sealed cans, without vacuum. At the time these coffees would normally be roasted in the course of regular plant operation, the experimental lots were removed from refrigeration and dry storage and taken to the laboratories for color observations, roasting and cup testing. The storage period was from early February to late September.

The different storage conditions tested were:

1. Dry storage warehouse in original bag.
2. Dry storage in sealed cans, without vacuum.
3. Cooler storage in original bags.
4. Freezer storage in original bags.
5. Freezer storage in pliofilm bags.

TABLE I—GAIN AND LOSS IN WEIGHT OF BAGGED GREEN COFFEE STORED IN REFRIGERATED AND DRY STORAGE

Grade of Coffee	Date Scored	Date Removed	Refrigerated Storage: Av. Gross Weight Per Bag*	Refrigerated Storage: Av. Gross Gain Per Bag	Refrigerated Storage: Gain in Weight	Dry Storage: Av. Gross Weight Per Bag*	Dry Storage: Av. Gross Loss Per Bag	Dry Storage: Loss in Weight	Net Difference in Weight in Favor of Refrigeration
			pounds	pounds	%	pounds	pounds	%	%
FIRST SERIES:									
High	7- 2-48	9-15-48	132	1.7	1.3	134	1.0	0.7	2.0
Grade	7- 2-48	11-22-48	133	2.0	1.5	135	2.0	1.5	3.0
Santos	7- 2-48	1-25-49	133	1.0	0.7	135	2.7	2.0	2.7
Old	7- 2-48	9-15-48	132	1.5	1.1	132	2.7	2.0	3.1
Crop	7- 2-48	11-22-48	129	2.3	1.8	132	2.3	1.7	3.5
Santos	7- 2-48	1-25-49	132	0.7	0.5	132	3.3	2.5	3.0
Fancy	7- 2-48	9-15-48	152	1.5	1.0	154	2.0	1.3	2.3
Washed	7- 2-48	11-22-48	152	2.0	1.3	155	3.3	2.1	3.4
Mexican	7- 2-48	1-25-49	152	0.3	0.2	154	4.3	2.8	3.0
SECOND SERIES:									
Fancy	1-13-49	3-22-49	153.3	1.0	0.7	154.0	-0.2**	-0.1**	0.6
Washed	1-13-49	5-18-49	153.2	0.7	0.5	153.8	0.0	0.0	0.5
Mexican	1-13-49	7-28-49	153.3	1.2	0.8	153.2	0.2	0.1	0.9

* Three bag sample.
** Represents a gain in weight.

Color comparisons of the green coffees upon removal from storage showed a marked difference in favor of the coffee stored under refrigeration. Both coffees held in dry storage in the original bags were considerably faded but the samples stored under cooler refrigeration had retained most of their original bright, attractive color. Color retention in freezer stored samples also was good. That of coffee in sealed cans in dry storage was no better than when stored in bags.

TABLE II—CUP TEST RATINGS OF STORED COFFEES. KANSAS CITY TESTS.

Coffee:	Storage	Tester:	A	B	C	D	E	Sum	Rating
September 22, 1949					First Test				
B275[1]	Dry, original bag		1[2]	5	3	5	5	19	5
"	Cooler, original bag		2	1	1	1	1	6	1
"	Freezer, original bag		4	2	4	2	2	14	2
"	Freezer, pliofilm bag		3	3	5	3	4	18	Tied 3 and 4
"	Dry, sealed can		5	4	2	4	3	18	
C345[1]	Dry, original bag		2	4	3	5	3	17	Tied 3 and 4
"	Cooler, original bag		4	1	2	3	1	11	1
"	Freezer, original bag		1	3	5	4	5	18	5
"	Freezer, pliofilm bag		3	5	4	1	4	17	Tied 3 and 4
"	Dry, sealed can		5	2	1	2	2	12	2
September 22, 1949					Second Test				
B275	Dry, original bag			4	5	4	3	16	5
"	Cooler, original bag			1	1	1	1	4	1
"	Freezer, original bag			2	2	3	4	11	2
"	Freezer, pliofilm bag			5	3	2	5	15	4
"	Dry, sealed can			3	4	5	2	14	3
C345	Dry, original bag			4	5	4	4	17	Tied 4 and 5
"	Cooler, original bag			1	1	3	2	7	2
"	Freezer, original bag			2	2	1	1	6	1
"	Freezer, pliofilm bag			5	3	2	2	13	3
"	Dry, sealed can			3	4	5	5	17	Tied 4 and 5
September 23, 1949									
B275	Dry, original bag		5	5	4		4	18	Tied 4 and 5
"	Cooler, original bag		1	1	1		3	6	1
"	Freezer, original bag		3	2	3		1	9	
"	Freezer, pliofilm bag		2	3	2		2	9	Tied 2 and 3
"	Dry, sealed can		4	4	5		5	18	Tied 4 and 5
C345	Dry, original bag		2	4	5		3	14	Tied 3 and 4
"	Cooler, original bag		3	1	1		1	6	1
"	Freezer, original bag		4	3	3		4	14	Tied 3 and 4
"	Freezer, pliofilm bag		5	5	4		2	16	5
"	Dry, sealed can		1	2	2		5	10	2
September 27, 1949					First Test				
B275	Dry, original bag			2		3	5	10	4
"	Cooler, original bag			5		5	4	14	5
"	Freezer, original bag			3		1	1	5	1
"	Freezer, pliofilm bag			1		4	3	8	Tied 2 and 3
"	Dry, sealed can			4		2	2	8	Tied 2 and 3
C345	Dry, original bag			4		2	3	9	3
"	Cooler, original bag			2		3	2	7	2
"	Freezer, original bag			5		5	1	11	4
"	Freezer, pliofilm bag			1		1	4	6	1
"	Dry, sealed can			3		4	5	12	5
September 27, 1949					Second Test				
B275	Dry, original bag			1		2	5	8	2
"	Cooler, original bag			4		1	1	6	1
"	Freezer, original bag			5		3	2	10	4
"	Freezer, pliofilm bag			2		4	3	9	3
"	Dry, sealed can			3		5	4	12	5
C345	Dry, original bag			1		4	4	9	3
"	Cooler, original bag			2		3	1	6	1
"	Freezer, original bag			5		5	2	12	5
"	Freezer, pliofilm bag			3		2	5	10	4
"	Dry, sealed can			4		1	3	8	2
October 10, 1949									
B275	Dry, original bag		4	3	1	5		13	4
"	Cooler, original bag		2	2	3	2		9	1
"	Freezer, original bag		3	4	2	3		12	3
"	Freezer, pliofilm bag		5	1	4	1		11	2
"	Dry, sealed can		1	5	5	4		15	5
C345	Dry, original bag		4	3	5	2		14	4
"	Cooler, original bag		1	1	1	1		4	1
"	Freezer, original bag		3	2	3	3		11	2
"	Freezer, pliofilm bag		5	4	4	5		18	5
"	Dry, sealed can		2	5	2	4		13	3
October 11, 1949									
B275	Dry, original bag			5	3		5	13	5
"	Cooler, original bag			2	4		4	10	3
"	Freezer, original bag			4	5		3	12	4
"	Freezer, pliofilm bag			1	1		1	3	1
"	Dry, sealed can			3	2		2	7	2
C345	Dry, original bag			5	2		5	12	5
"	Cooler, original bag			3	1		4	8	2
"	Freezer, original bag			4	4		2	10	Tied 3 and 4
"	Freezer, pliofilm bag			1	3		1	5	1
"	Dry, sealed can			2	5		3	10	Tied 3 and 4

[1] Coffee B275 was a fancy high grown Guatemala Strictly Hardbean. No. C345 same coffee, designated Hardbean.

[2] This tester was suffering from a severe cold at the time this test was made.

At intervals, following removal from storage on September 21, during which time the green coffees were held at room temperature, experimental roasts and cup tests were made of each storage lot. The results of these tests are set out in Table II. From three to five professional coffee tasters constituted a panel during each test and all tests were made blind. The basis of rating is: 1-best, 2-next. The coffee having the lowest sum thus is in first place on the combined rating.

The consistently high ranking in cup quality of the brew made from the coffees held before roasting in cooler storage, as set out in Table II, is very interesting. As would be expected with a panel composed of several members, there was some variation in the ranking of the various samples by different individuals, but in spite of this the coffee from cooler storage ranked first or nearly so in all of the early cup tests. By the time of the October 11 sampling there was less difference between samples and it was more difficult to make comparisons between the differently stored coffees.

TABLE III—TOTAL SCORES OF CUP TESTS RATINGS

Coffee	Storage	Score	Rating
B275	Dry storage, original bag	97*	4
"	Cooler, storage, original bag	55	1
"	Freezer storage, original bag	73	2
"	Freezer storage, pliofilm bag	73	2
"	Dry storage, sealed can	92	3
C345	Dry storage, original bag	92	5
"	Cooler storage, original bag	49	1
"	Freezer storage, original bag	89	4
"	Freezer storage, pliofilm bag	85	3
"	Dry storage, sealed can	82	2

* Lowest score in best rating. Best possible score 26, poorest possible score 130.

The summary of all the tests included in Table II is presented in Table III. This shows that in the case of both of the green coffees used the beans stored in cooler refrigeration in the original bags produced roasts of superior cup quality. Similar lots of coffees in bags held in dry storage, gave roasts of lowest cup quality. Green coffee stored in the freezer in the original bags was better than dry stored coffee, but inferior to that stored in the cooler. The use of pliofilm bags in freezer storage was of little value or detriment. Placing the coffee in tight cans in dry storage showed no significant benefit. It should be pointed out, however, that the differences between the variously stored coffees, as measured by these cup tests, are of small magnitude. In the case of the data reported in Table III, where the best possible score was 26 and the poorest possible score was 130, it would not be unusual among coffees fairly close together in quality for the best coffee to show a score of 26 and the worst one score 130. In these tests the scores all were relatively close together. In other words, the variously stored coffees were still all good coffees, but the cooler stored coffee was at the top of the list.

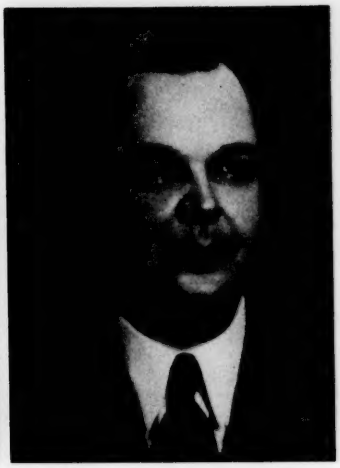
Results of Toledo Experiment are Confirmed

This provides excellent confirmation of the results of the Toledo experiments in favor of cooler stored green coffee. The temperature and relative humidity that may be obtained in cooler storage appear to be the most nearly optimum for retention of appearance and quality of any of the holding conditions so far studied.

(Continued on page 88)

Arthur N. Otis, New York, N. Y.
President, N.A.R.W.

C. D. Johnston, Roanoke, Va.
President, A.W.A.



Fred F. Alford, Dallas, Tex.
Vice-president, N.A.R.W.

The Officers - Executive Committee - Committee Chairmen - Chapters - Refrigeration Research Foundation

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Vice-president, NARW—Fred F. Alford, Alford Refrigerated Warehouses, Dallas, Tex.

Treasurer, NARW—J. L. Gagini, Omaha Cold Storage Co., Omaha, Nebr.

Executive Vice-president NARW—William Dalton, Washington, D. C.

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P. D. Burrill, Quincy Market Cold Storage & Warehouse Co., Boston, Mass.
G. F. Dodson, Security Warehouse & Cold Storage Co., San Jose, Calif.
Harry Foster, Cincinnati Terminal Warehouses, Cincinnati, Ohio
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J. P. Johnson, Terminal Refrigerating & Warehousing Corp., Washington, D. C.
W. A. Kopke, Chicago Cold Storage Co., Chicago, Ill.
Wm. A. Moore, New Orleans Cold Storage & Warehouse Co., New Orleans, La.
E .E. Seymour, United States Warehouse Co., Detroit, Mich.
C. E. Simmon, Big 4 Ice & Cold Storage, Oklahoma City, Okla.
H. W. Wilson, Quaker City Cold Storage Co., Philadelphia, Pa.

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Safety: A. R. Shepherd, Fulton Market Cold Storage Co., Chicago, Ill.
Banking: H. W. Wilson, Quaker City Cold Storage Co., Philadelphia, Pa.
Legislation: J. P. Johnson, Terminal Refrigerating & Warehousing Corp., Washington, D. C.
Insurance: Richard Klinck, Merchants Refrigerating Co., New York, N. Y.
Pacer: Garth Shoemaker, Hygeia Refrigerating Co., Elmira, N. Y.
Costs: E. E. Hesse, United States Cold Storage Corp., Chicago, Ill.

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- Jerry Johnson, chairman, Terminal Refrigerating & Warehousing Corp., Washington, D. C.
- Carleton Peacock, secy., Quaker City Cold Storage Co., Philadelphia, Pa.

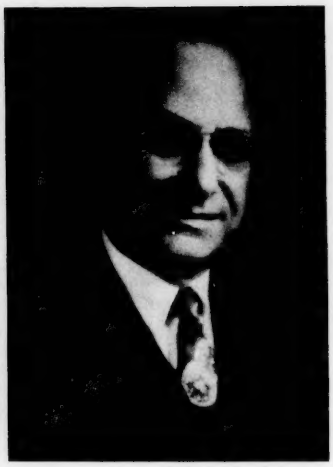
Great Lakes Chapter
- R. M. Connors, chairman, U. S. Cold Storage Co., Chicago, Ill.
- William C. Baker, secy., Produce Terminal Cold Storage, Chicago, Ill.

Southeastern Chapter
- T. E. McCrary, chairman, Memphis Cold Storage Warehouse Co., Memphis, Tenn.
- C. A. Martin, Jr., secy., Polar Cold Storage, Nashville, Tenn.

Southwestern Chapter
- J. K. Dozier, chairman, Houston Terminal Warehouse & Cold Storage Co., Houston, Tex.
- D. A. Laird, secy., Texas Creamery Cold Storage Co., Houston, Tex.

J. L. Gagini, Omaha, Nebr.
Treasurer, N.A.R.W.

Wm. Dalton, Washington, D. C.
Executive Vice-pres. N.A.R.W.



Edgar M. Burns, Portland, Ore.
Executive Committee, N.A.R.W.

South Pacific Chapter
Ludvig Ubbe, chairman, Los Angeles Cold Storage Co., Los Angeles, Calif.
Jack L. Dawson, secy., Pacific States Cold Storage Warehousemen's Ass'n., San Francisco, Calif.
North Pacific Chapter
J. R. Goodfellow, chairman, Olympic Warehouse & Cold Storage Co., Seattle, Wash.
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Missouri Valley Chapter
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A. F. Versen, secy., Security Bldg., St. Louis, Mo.
New Jersey State Association
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Refrigeration Research Foundation Program for Annual Meeting

THE annual meeting of the Refrigeration Research Foundation will be held at the Edgewater Beach Hotel, Chicago, January 26-28, 1950. The following tentative program is announced:

Thursday, January 26

10:00 a.m. Meeting of Scientific Advisory Council. While this is a meeting primarily for discussion of research and other matters of technical nature which the Council members consider each year, interested members of the Industry and the Foundation are welcome to attend.

Friday, January 27

10:00 a.m. TRRF Council and Membership Meeting: Green and Roasted Coffee Storage, C. E. Baker, Purdue University; New Uses for Refrigeration and Refrigerated Warehousing, B. E. Proctor, Massachusetts Institute of Technology.
12:15 p.m. Social Get-Together and Luncheon
2:00 p.m. TRRF Council and Membership Meeting. Reports by Project Leaders: Candy and Nut Storage, J. G. Woodroof, Georgia Experiment Station; Informal Discussion of Air Purification in Cold Storage by Warehousemen and Technical Men.

Saturday, January 28

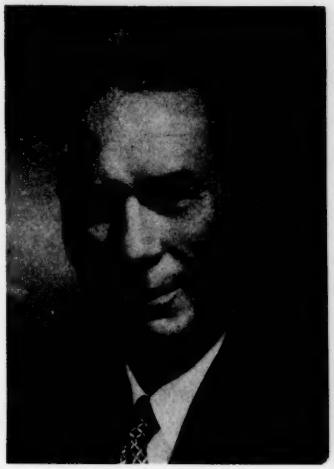
10:00 a.m. Membership Business Meeting
1. Report by Chairman of the Board
2. President's Report
3. Treasurer's Report
4. Director's Report (informal)
(Printed formal TRRF Annual Reports will be available)

12:15 p.m. Social Get-together and Luncheon
2:00 p.m. Foundation Business and Reports
1. Relative Humidity Determinations at Low Temperatures—B. H. Jennings, Northwestern University
2. Membership Business
3. Elections

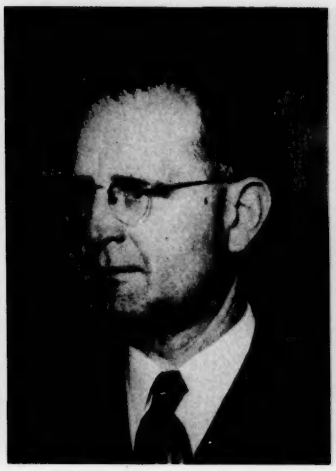
6:00 p.m. Board of Governors Get-Together and Dinner

Sunday, January 29

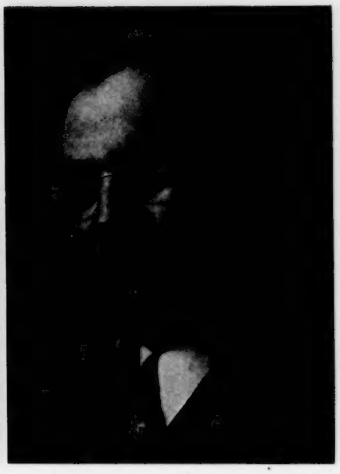
9:00 a.m. Executive Committee Breakfast



P. D. Burrill, Boston, Mass.
Executive Committee, N.A.R.W.



G. F. Dodson, San Jose, Calif.
Executive Committee, N.A.R.W.



Harry Foster, Cincinnati, Ohio
Executive Committee, N.A.R.W.

"Get Fit For The Fifties" is Theme For 59th Annual A. W. A. Meeting

WAREHOUSE operators from all over the United States will converge on Chicago January 30 to February 1 for brass tacks discussions of storage and distribution problems. The occasion is the 59th Annual Meeting of the American Warehousemen's Association. Headquarters will be the Edgewater Beach Hotel.

Following the usual custom, there will be joint and separate sessions of AWA's two Divisions—the National Association of Refrigerated Warehouses and the Merchandise Division. The customary morning-long opening general session will take place at a luncheon on Monday, January 30. Feature attraction at this event will be an address by the Honorable Everett Dirksen, former Congressman from Illinois.

Three full days of separate divisional meetings will be held on Monday, Tuesday and Wednesday. On Thursday, February 2, NARW delegates will move downtown to the Congress Hotel for the general sessions of the frozen food convention.

This 1950 convention, coming at the beginning of a new decade, is planned to help progressive warehousemen "Get Fit for the Fifties." Real "dollars and cents" subjects are up for thorough discussion. In keeping with this purpose the NARW sessions will keep formal speeches to a minimum. All day open discussions will cover such subjects as cost reduction programs, labor problems, new legislation, improved warehousing methods and services, research, farm price supports, employee relations, insurance and welfare programs, collective bargaining procedures, etc. The Wednesday morning session will give the refrigerated warehouse operators an opportunity to see themselves as others see them when a panel of prominent warehouse customers frankly tells what each would do "If I Were a Warehouseman . . .?"

The two very able moderators, Henry Kuehn and Harold Emerson will provide members of the convention with plenty to talk about. A brand new procedure will be used. This will be something different in the conduct of an open forum, offering the most and best in an exchange of industry information.

Social features in which both Divisions will participate include the President's Reception on Wednesday evening preceding the 59th annual banquet. Tuesday evening the regular AWA Family Party will be held. Both of these events will feature outstanding entertainment. A special program of events is being prepared for the ladies.

NARW Program and Schedule of Events

Sunday, January 29

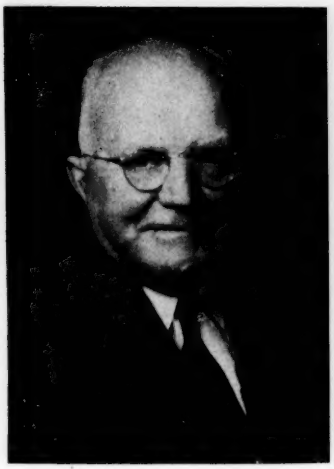
Registration—All Day
10:00 a.m. NARW Legislative Committee Meeting—American Room
12:00 Noon. NARW Executive Committee Meeting
4:00 p.m. AWA General Board Meeting—Sheridan Room

Monday, January 30

8:00 a.m. NARW First Timers' Breakfast—South Terrace; Remarks by President Arthur N. Otis; Welcome by Vallee Appel, Chicago

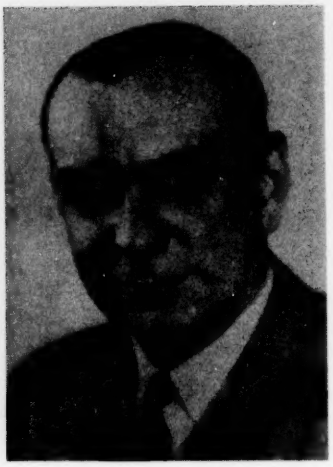
NARW Session—East Lounge

9:30 a.m. Remarks of President, Arthur N. Otis
9:45 a.m. Report of Treasurer, J. L. Gagini
9:50 a.m. Announcements



H. A. Gross, St. Louis, Mo.
Executive Committee, N.A.R.W.

J. P. Johnson, Washington, D. C.
Executive Committee, N.A.R.W.



W. A. Kopke, Chicago, Ill.
Executive Committee, N.A.R.W.

10:00 a.m. "Your Employee and Your Cost Reduction Program (Film on cost reduction, mechanization, etc. A general film depicting what an employer can do to better operate under today's conditions.)
10:30 a.m. Film Forum
11:55 a.m. Report of Nominating Committee
12:30 p.m. Luncheon, Marine Dining Room, Presiding, General President A.W.A., C. D. Johnston
Invocation and Necrology—Rev. Charles R. Goff, First Methodist Church of Chicago
Introduction of Divisional Presidents, J. Leo Cooke, Arthur N. Otis
Report of General Treasurer
Remarks of General President, Clem D. Johnston and Introduction of the Honorable Everett Dirksen
Address—The Honorable Everett Dirksen

NARW Session—East Lounge

2:30 p.m. Open Forum—W. J. Mills, Los Angeles, chairman, and two others (union and non-union).—Industrial Relations
a. Collective Bargaining Procedure
b. Wage levels—Work week—Saturday closing—Welfare conditions
c. Other Employer-Employee Relations
d. Minimum Wage Law
4:00 p.m. Group Insurance — H. Cochran Fisher (NARW Agent)
5:00 p.m. Adjournment
6:30 p.m. Get Acquainted Cocktail Party (AWA)—West Lounge

Tuesday, January 31

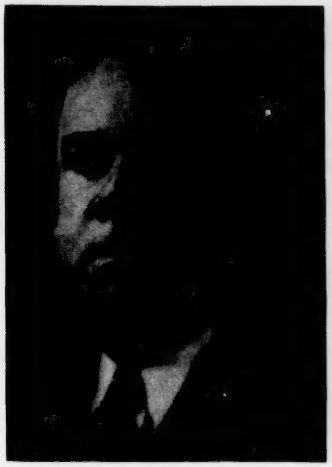
8:00 a.m. Committee Breakfasts
9:00 a.m. A Brand New Movie—$'s In Your Pockets
9:30 a.m. Legislative Roundtable — J. P. Johnson, Washington, Leader
10:00 a.m. All day open forum on industry problems. Leaders: Harold C. Emerson, Bridgeton, N. J.; Henry C. Kuehn, Milwaukee.
Probable Topics: New Wholesale Produce Markets; Effect of Farm Price Supports; Standardization of Tariff Form; Value of Aluminum as an Insulation Medium; Traffic Conditions and Costs Affecting Industry Operations; Other New or Improved Warehousing Methods; Special Services to Customers; Reports of Cold Storage Holdings, Space and Space Occupancy; Adequacy of Existing Cold Storage Space; Cold Storage Research—Temperatures, Relative Humidity, New Commodities.
11:45 a.m. Election of Executive Committeemen
12:30 p.m. Luncheon New Executive Committee Meeting
2:00 p.m. All Day Open Forum—Continuation
5:00 p.m. Adjournment
7:30 p.m. "AWA Family Party" Dinner—Marine Dining Room

Wednesday, February 1

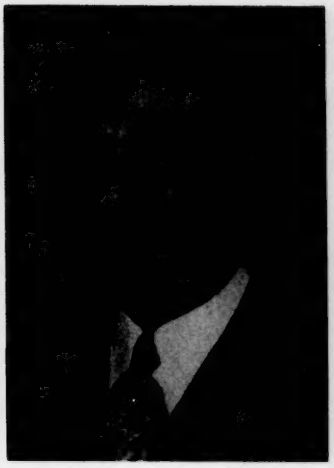
9:00 a.m. Movie—$ In Your Pockets
9:30 a.m. If I were a Warehouseman . . . ??? Customers Panel and Open Forum
A. E. Huff, manager, Warehousing and Transportation, Birds Eye-Snider Division, General Foods Corp., New York City
Malcolm J. McCluan, National Wholesale Frozen Food Distributors, Inc., Pittsburgh, Pa.
C. D. Carpenter, Institute of American Poultry, Industries, Chicago
11:00 a.m. "Your Government and You" by M. J. Hudtloff, director, Transportation and Warehousing Branch, Production and Marketing Administration, U. S. Dept. of Agriculture.
12:00 noon Pacer Luncheon, South Terrace; presiding, President A. N. Otis
2:15 p.m. Get Fit for the Fifties—Industry Statistics, G. A. Shoemaker
3:15 p.m. Report of Resolutions Committee
3:45 p.m. Installation of Officers
3:55 p.m. Adjournment to AWA Closing General Session

Closing AWA General Session

4:00 p.m. Presiding: General President Clem D. Johnston
Announcements and Remarks
Report of Resolutions Committee
Nominating Committee Report
Announcement of new Divisional Officers
Election of AWA General Officers
Old and New Business
6:30 p.m. Presidents' Reception—West Lounge
7:30 p.m. Annual AWA Banquet—Ballroom
Introduction of Dignitaries
Presentation of General President's Gift
Introduction of New Officers of AWA and Divisional Officers
Entertainment



Wm. A. Moore, New Orleans, La.
Executive Committee, N.A.R.W.



E. E. Seymour, Detroit, Mich.
Executive Committee, N.A.R.W.

C. E. Simmon, Okla. City, Okla.
Executive Committee, N.A.R.W.

A Welcome to Chicago

CHICAGO is permitted the exceptional privilege this year of extending its open arms, in most pleasant anticipation, to the arrival of the Convention of the American Warehousemen's Association.

Arrangements have been made for this occasion at the Edgewater Beach Hotel, one of Chicago's best equipped for your entertainment where everything is offered to make the visit for you and your guests completely comfortable and enjoyable.

We are looking forward to a large attendance, and the more the greater will be our happiness.

If you have not sent in your reservation to the hotel, please do so as quickly as possible.

WALTER A. KOPKE
Member Executive Committee
National Association Refrigerated Warehouses

From Association Headquarters - To Members of NARW

THE Association staff and officers have been working to constantly increase services to the membership individually and collectively. They have also had to grapple with several unforeseen problems. Legislative matters in particular received considerable time and attention—with successful results.

Member inquiries and requests for various Association services reached record proportions. This membership participation in Association affairs is being encouraged and expanded.

NARW took a long needed step in the publication of "Q. A.", now being distributed to customers, schools, employees, local groups, and opinion molders. This folder tells the Industry's story briefly and factually. It is just the first in a planned series of educational and informational pieces about our Industry's vital part in marketing our nation's perishable foods.

One of the important steps taken by NARW this year was the installation of a group life insurance plan for the employees of Association members—especially those unable to employ such a plan otherwise. This new and unusual membership service was under consideration and investigation for nearly a year. Its installation marks NARW's entry into an entirely new field of activity and is indicative of the forward looking approach the Association is taking toward ever-increasing membership service.

Adoption of the recommendations of a special committee appointed to investigate ways and means of improving the membership bulletin — "COLD FACTS" — has given the publication a wider scope and more convenient form. Both factual and editorial ("Pink Sheet") reporting on industry and governmental matters have been broadened.

These are but few of NARW's 1949 accomplishments. Other activities included such matters as the proposed uniform commercial code, USDA monthly cold storage report revision, membership promotion, allied industry relations, press and public relations, legislation, and a host of others.

As this year draws to a close, I want to take this opportunity to express my appreciation for the support our Industry has given me as NARW President for 1949. The results are more than satisfying.

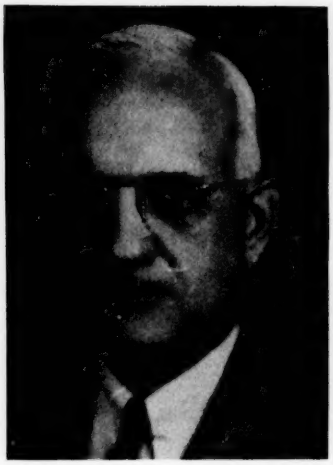
BY ARTHUR N. OTIS
President, N.A.R.W.

THE headline over the convention program "Get Fit for the Fifties" is not just a phrase to catch attention. Instead it's a command, sort of. It's also a challenge,—from your customers, your employees and your industry.

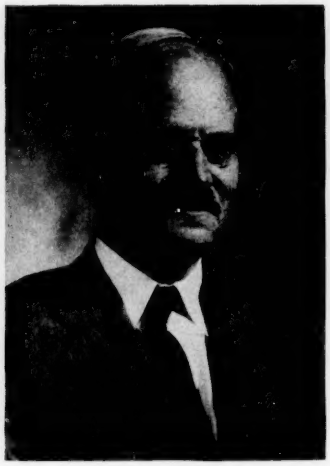
We're not "commanding," understand. We're just "suggesting" that if ever there was a time when "getting fit" was appropriate—and actually more important than other times—it is now. The fifties are going to see some unusual developments in the Refrigerated Warehousing Industry.

There are lots of reasons, in addition to the above, why the officers and committeemen of NARW urge that you attend the 59th Annual Meeting in Chicago, January 30-February 2. Here are only a few:

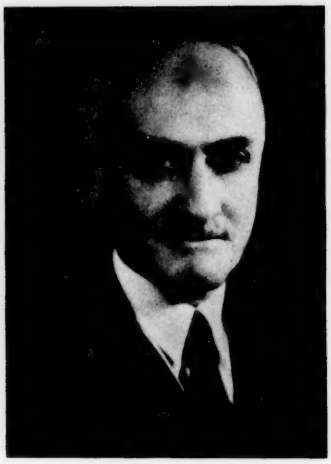
1. This year's program was designed for you. It will be a dynamic down-to-earth free-for-all of tremendous import during these days and times. There will be ideas galore—but if you pick up just one that will be good for your business, your attendance will be worth while.



H. W. Wilson, Philadelphia, Pa.
Executive Committee, N.A.R.W.



Dr. S. C. Prescott, Boston, Mass.
Chairman of Board, T.R.R.F.



Vallee O. Appel, Chicago, Ill.
President, T.R.R.F.

2. A few—only a few—formal speeches will be made, and those will be right down your alley. You have told us you don't like dry and long drawn-out speeches. O.K. That's what you are NOT going to get.

3. Attendance at the Frozen Food Convention on Thursday, February 2, is worth a trip to Chicago all by itself. That's when the "General sessions" of the Frozen Foods Industry, consisting of the Packers, Brokers, Distributors, Preservers, and Refrigerated Warehousemen, will take place—at the Congress Hotel downtown.

4. Accommodations at the Edgewater Beach are delightful. Those of you who have stayed there already know that. The hotel staff is going "all out" for our convention.

These are only a few reasons for coming to Chicago and getting fit for the fifties. There are many others. You owe it to yourself and your firm to sit in on one of your Industry's most important gatherings in many years.

SEE YOU IN CHICAGO.

By William Dalton
Exec. Vice-Pres. N.A.R.W.

Refrigerated Warehousing---What it Means to Food Distributing Agencies

THERE is serious question whether the preserve industry could exist at all on its present high volume level without the growth and development of a sound and widely dispersed refrigerated warehouse industry.

Your welfare and ours are inextricably intertwined . . . and in extending to you the best wishes of the National Preservers Association for a successful convention and a prosperous New Year, we are in a certain sense exhibiting little more than an enlightened self interest.

We do hope, however, that the relations of our two industries will continue into the future on as cordial and as reciprocally profitable a basis as in the past.

By R. J. Glaser, President
National Preservers Association

FOOD distribution has often been compared to a chain composed of many links. If any of these links are weak, the distribution process is hindered and all the other links are at a disadvantage. On the other hand, strong links build a great industry.

The frozen food industry is an example of the interdependence of each of the various links in the chain. As the various segments of the industry work together, the industry grows in strength and in importance. One of the important links in this chain is the refrigerated warehouse which contributes so much to make frozen foods possible for the American consumer.

It is elementary that without refrigeration there would be no frozen food industry. But the service of the refrigerated warehouse goes beyond this. It makes it possible for frozen foods to be available to the consumer at a moderate price throughout the year. Packing seasons are generally short. Thus, as in other segments of the food industry, storage becomes essential. But frozen foods depend on more than storage. They require storage of a very special kind. The facilities for this storage are expensive, and beyond the means of most packers.

The service of the refrigerated warehouses goes further than this, however. They make it possible to store the frozen foods where they are needed. In the words of the economists, they add the utilities of time and place to the process of distribution.

On the occasion of the Annual Convention of the National Association of Refrigerated Warehouses, Inc., we would like to salute this fellow worker in the frozen food scheme of things. Like the food broker, the refrigerated warehouse has contributed much to the food industry, and especially to the frozen food industry. There are still problems existing, to be sure. There is much to be done so that the consumer is best served and the industry grows to its rightful stature. But the cooperation of the past has proved that all problems can be solved by everyone working together. If each realizes its interdependence with the other links, the problem will merely become stepping stones to a truly bright future.

By Watson Rogers, President
National Food Brokers Association

Q. A. — New NARW Folder Informs Public on Refrigerated Warehousing Service

A NEW public relations service, designed to keep customers and prospective customers informed on the services available from refrigerated warehouses, has just been released by the National Association of Refrigerated Warehouses. It is, "Q. A.—Answers to the most frequently asked questions about refrigerated warehouses." It describes the functions and importance of refrigerated warehousing in perishable food distribution, telling its story in sixteen brief, concise questions and answers, supplemented with photographs of cold storage operations. The questions are those most frequently asked about refrigerated warehousing and came mostly from editors, students, researchers, teachers and others seeking information about the industry and its operations.

The folder is printed in two colors and is designed for quick reading or a permanent ready reference. Distribution is now being made through NARW and its members to employees, customers, schools, colleges, civic and religious organizations, farm groups, editors, government, research organizations, and other interested groups.

Its purpose goes beyond merely supplying the answers to questions. The information it gives demonstrates the vital role refrigerated warehousing plays in the improving distribution of perishable foods from farm to table. The extent and variety of cold storage services are also brought out.

This new folder provides a public relations medium pointed in the right direction. It fills a long standing industry and association need for an attractive, informative, and publicity piece. In lots of 500, they may be obtained for 2½ cents each or with name of company imprinted thereon, for 5½ cents each.

The folder is illustrated with five pictures: showing frozen eggs in a freezer room; engine room of a modern refrigerated warehouse; modern transportation and stacking equipment; a blast freezing room for freezing foods; boxed apples in a cooler storage room.

Copies are available to individuals or groups and may be obtained from NARW members or the NARW office, 608 Tower Building, Washington 5, D. C.

The questions and answers in this folder read as follows:

Questions and Answers

1—What is a public refrigerated warehouse?
A specifically constructed building . . . heavily insulated . . . scientifically refrigerated . . . designed for the safe, healthy storage of perishable foods.

2—How many public refrigerated warehouses are there in the U. S.?
About 750

3—How much storage space do these refrigerated warehouses contain?
413 million cu ft. . . . this equals one building 100 ft. wide, 10 ft. high and nearly 80 miles long.

4—How much perishable food can these warehouses store at one time?
Four billion pounds. This is more than 53,000 refrigerator car loads . . . a train 445 miles long.

5—What are the functions of these refrigerated warehouses?
To store foods during their season of production and processing . . . preserve them until needed during the season of non-production . . . to provide a year-round reservoir of perishable foods for the tables of the nation.

6—What other services do refrigerated warehouses perform?
Quick freezing of foods . . . refrigerator car icing . . . pool car distribution . . . pipe line refrigeration . . . egg breaking, drying and candling . . . poultry dressing and eviscerating . . . meat curing . . . ice manufacture, etc.

7—Who stores goods in refrigerated warehouses?
Growers, producers, processors, distributors and packers of fresh, frozen and canned foods . . . bakers . . . brewers . . . hotels . . . restaurants . . . retail grocers . . . hospitals . . . chemical manufacturers . . . florists . . . ice cream and candy manufacturers, etc.

8—What advantages do public warehouses offer these storers?
Flexibility of storage space . . . experienced personnel . . . establishment of spot stocks throughout the country . . . warehouse receipts issued against goods in storage may be used as collateral for loans . . . generally lower insurance rates . . . better control of distribution costs.

9—How many different kinds of products are generally held in cold storage?
About 250. They include: fresh and frozen fruits . . . vegetables . . . meat . . fish . . . poultry . . dairy products . . . nuts . . . dried fruits . . . candy . . . florists' stock . . . drugs . . . molasses . . . hides . . . glucose . . . herbs, etc.

10—How are foods stored and cared for in refrigerated warehouses?
Each commodity is accorded individual care . . . is stored under special conditions most conducive to its preservation. This means: proper stacking . . . scientifically correct temperature and relative humidity . . . proper air circulation and conditioning . . . scrupulous sanitation.

11—Does cold storage affect the flavor and nutritious value of perishable foods?
Modern, scientific refrigeration preserves the fresh flavor . . . texture . . . color . . . nutritional value of perishable foods for the storage life of the product.

12—What is the safe storage life of perishable foods?
It varies with each product. A few days for mushrooms . . . 9 months for shell eggs . . . 2 years or more for frozen foods.

13—Does the storage of perishable foods cause high prices?
No. It has a leveling effect on food prices . . . prevents disastrously low prices to farmers during the season of production . . . prevents exorbitantly high prices to consumers in season of non-production.

14—Does the expense of storing foods in refrigerated warehouses add appreciably to the cost of these foods?
No. To store a dozen eggs for six months costs about ⅓ cent . . . a pound of apples one cent . . . a 12 oz. package of frozen food ¾ cent.

(Continued on page 88)

Confectionery Industry Seeks Information on Refrigerated Storage of Candy

By G. Lloyd Latten

Gen. Mgr. Schutter Candy Division Universal Match Corp., Chicago, Ill., Chairman Refrigerated Storage Project Committee, National Confectioners' Association

UNDER what temperature and humidity conditions does candy have the longest shelf life? What storage conditions are best for peanuts and pecans which are to be used in candy making?

These are typical questions which the National Confectioners' Association seeks to answer through its two research projects on refrigerated storage now in progress at the Georgia Agricultural Experiment Station. Cooperating in these two projects with the confectioners are the Refrigeration Research Foundation and the Georgia Agricultural Experiment Station.

The first of the two projects is of six months duration and deals solely with the effects of humidity and temperature on the shelf life of confectionery. The second, of eighteen months duration, will determine whether peanuts and pecans, if kept under refrigerated storage, can be used in making candy the year around.

PROJECT "A": Cold Storage of Candy

Since there are few available data on the proper temperature and humidity conditions for keeping candies from the time they are manufactured until they are consumed, a study of this kind was acutely needed by the industry. The information resulting from this this work will be of untold value to both the manufacturer and the wholesaler.

This project will result in known humidity and temperature conditions for 18 types of candy. While it is recognized that there are hundreds of different candies, the 18 types selected for this research are representative of various general classifications. The candies being tested in Project "A" are:

Candies Under Test

Hard Butter Creams (similar to Candy Corn)
Hard Candy
Chocolate Coated Hand Roll Creams
Chocolate Coated Cast Creams
Jelly Gum Drops
Taffy Kisses
Plain Fudge
Marshmallows
Plain Caramels
Chocolate Coated Peanuts
Peanut Brittle
Sugar Bonbons
Crystallized Cocoanut Squares
Solid Chocolate (Milk and Sweet)

Three types of Candy Bars (Chocolate Coated Nut Rolls, Uncoated Nut Rolls, Chocolate Coated Nougat Bars).

These eighteen types are being tested under 16 different combinations of temperature and humidity. Under the two lowest temperatures, each type of candy will be examined at least one a week for

(1) Loss or gain in weight
(2) Change in finish or appearance
(3) Change in aroma.

Under the two highest temperatures, the candy will be examined twice a week. Final data on Project "A" will be published, it is expected, in late February, 1950.

PROJECT "B": Refrigerated Storage of Peanuts and Pecans for Making Candy the Year Around

Project "B", which is of eighteen months duration and will not be completed until early 1951, deals with the refrigerated storage of peanuts and pecans for making candy the year around. The main objective of this project is to compare the quality of candies made, throughout the year, from refrigerated and non-refrigerated, shelled and unshelled peanuts and pecans.

Peanuts contain about 45 per cent oil and pecans contain about 70 per cent oil, which becomes stale and rancid quite readily during warm or hot weather. Peanuts are a favorite host for several types of insects at temperatures about 50 F. With the development of staleness in nuts there is a loss of fresh flavor and a darkening of the skins, which detracts from their appearance.

It has been found that the initiation of staleness and rancidity in nuts is very early after harvest. In fact, the methods of harvesting as well as each step in handling from the field to the consumer, tends to make better or poorer quality in the finished candy products. The storage temperature of peanuts has been found to greatly influence the color, flavor and quality of peanut butter and salted peanuts. Peanuts once subjected to objectionably high storage temperatures were never again as good as those that were properly stored.

However, despite the present information on storage of nuts, there is need for more data on the influence of refrigeration on peanuts and pecans to be made into candies the year around. There is also need for information as to whether or not peanuts and pecans for making candies the year round should be shelled before storing. It is possible that the quality of peanut or pecan candies (as is also the case with salted peanuts and peanut butter) can be enhanced through proper storage of the nuts prior to manufacture.

Project "B" is being carried out in the following manner. Two types of peanuts commonly used in candy making, have been purchased and have been placed in storage. Two portions of both types have been shelled. One portion has been placed under refrigerated storage in a commercial warehouse; the second portion has been placed in a common storage room at the Experiment Station and is fumigated periodically by accepted standards. Two portions of both types remain unshelled and have been placed under the same storage conditions. Two types of pecans have been handled in the same manner.

At four month intervals samples of the peanuts and pecans will be removed from storage and made into candies, one type of candy with the peanuts and pecans entirely covered by the candy and the second, with the peanuts or pecans partially exposed. At the same time, chemical and organoleptic tests will be run on corresponding peanut and pecan samples. The tests will serve to explain many of the results obtained from examining the candies.

After the confections are made, they will be examined

(Continued on page 86)

The Refrigeration Research Foundation's First Six Years

By H. C. Diehl, Director

H. C. Diehl

RESEARCH is everybody's business. It is not the obligations of government alone, nor is it the duty only of universities and agencies supported by philanthropy. Similarly it is not an activity that should be in any manner restricted to large private corporations.

Research is also an important part of the business of industrial groups, of those members of an industry who perform a necessary part in the sound functioning of the national economy.

Only a forward-looking, challenge-meeting group of industrialists can face up to the opportunities, and also the obligations, that lie in a program of research. Six years ago, when The Refrigeration Research Foundation was started, there was a large group of leaders in the refrigerated storage industry who believed firmly that their position in the nation's business, their experience, their competence, their investment, and their rightful opportunities and obligations made it incumbent that they participate in research.

At that time industry leaders in general were arriving at a broadened conception of the intimate, integrated and essential part that research must play in a world that needs competence, intelligence, and wisdom, more than it ever has needed those human attributes in the past. Now, in the post-war years, we need research and science more than ever, not alone to increase our ability to protect ourselves and others, through force if necessary, but also to demonstrate to ourselves and others the value of progressive solution of daily problems in well-ordered peaceful living.

Two Questions

The refrigerated-storage industry six years ago contained leaders who felt the compulsion that these broad facts generate.

It is a noteworthy historical fact that in 1943 three warehousemen—Arnold Hampson, Garth Shoemaker and Jack Meagher—stimulated the creation of the Foundation by fanning into bright glow the flame of interest, which has been lighted and re-lighted by a succession of industry leaders, notably Royal Switzler, Gardner Poole and Roy Hagen.

The result was the Foundation, as we have it today, an organization built on experience compounded from faith, hard cash, a few ventures that were calculably hazardous and perhaps proved unprofitable and many others that have succeeded in accord with expectations, or have even exceeded them.

Two questions of broad meaning may well be asked immediately in this presentation. First, does the law of diminishing returns apply in research? That is, do we reach a stage at which it doesn't seem profitable to engage in more research? This is a rather philosophical problem and its answer develops an attitude rather than a body of fact. Certainly there is no current evidence that science, or even that portion which relates to our industry, has begun to lack new areas for exploration or suitable tools for such undertakings. There is an enormous amount of practical good that refrigeration and refrigerated storage could do, in addition to what we are already doing, if we only knew how.

Benefits of Refrigeration

The benefits already conferred on agriculture and food economy by refrigeration are prodigious. They advance not only industrial techniques, but touch individual welfare because of the protection and conservation of perishable foods which have such an important role in human health and productivity. And the possibilities of refrigeration have only been moderately exploited, even with the knowledge we now possess.

In six years of intensive work, The Refrigeration Research Foundation has done a great deal to place the low temperature preservation of food on a generally scientific basis. Its accomplishments would have been completely worthwhile if they had been confined to correlation of existing facts and data for use in the industry, but they have gone far beyond to explore new methods and new uses of the services the warehouse has to offer.

With so much accomplished is the job largely done and is the saturation point approaching? Part of the answer can be found in the industry itself. Are all its problems solved and is it satisfied with the present volume and character of its business? The answer is obvious but in addition there is a large area of productive work ahead for T R R F. It provides the best basis of inter-industry cooperation between warehousemen and their present and potential customers. Of equal importance is the work it will do to bring real appreciation of the value and quality of cold stored commodities to the consuming public.

The story of the Foundation work is told here by Dr. (Dutch) Diehl who organized its research program and has directed it through these six productive years.

The reason for raising this question is that all of us hear it now and then, and the reason why we hear it is that we still know many people who believe research scientists are long-whiskered geniuses living in a world apart from which they occasionally release amazing and revolutionary discoveries. It is true we must have fundamental science; otherwise we would soon have little or no applied science. As Dr. Vannevar Bush remarked in his recent *Life* magazine article, applications in World War II almost used up our store of fundamental scientific knowledge.

Fundamental scientists are in fact highly trained, but otherwise very human people, and research—even atomic research—is in final analyses everybody's business. We can all find problems and if they are important enough we

can find the right kind of competence to solve them. Research yields diminishing returns if those who apply it lose the youthful outlook—if they fail to want to find new and better ways to get results.

The other pertinent question is this: Are industry leaders—let us think particularly now of leaders in the refrigerated storage industry—competent to participate in the direction of a research program My answer again is yes, of course, and I say yes firmly, because of the many occasions on which I have seen industry experience operating not only as a successful guiding force, but also as a final evaluating force.

A large portion of the projects sponsored and aided by the Foundation have arisen from suggestions from industry men. Some have come from scientists, all have necessarily received the approval of the Foundation Executive Committee. The point I am making, because I believe it deserves emphasis, is that industry experience, aside from technical training or background, counts heavily in the advancement of technical progress.

Program in Brief Review

For instance, the curiosity and acumen of one of our industry leaders, L. M. Ashenbrenner of the Great Lakes Terminal Warehouse Co. in Toledo, and his association with Ralph Brucksieker of Woolson Spice Co., gave us the study on coffee storage, reported in this issue of ICE AND REFRIGERATION. The Foundation fund for short term investigations at Purdue University brought technical training to the aid of the project in the person of Dr. C. E. Baker, and further elaboration has brought other warehousemen and commercial coffee companies into the action picture.

The result has been increasing knowledge of the nature and extent of benefits that refrigerated storage can confer upon green and roasted coffee. The knowledge we have now is capable of elaboration and refinement, but the main point is that we have arrived at knowledge of how to apply refrigeration in a beneficial manner to a commodity not ordinarily refrigerated.

Now I want to mention the new projects—those that have got under way roughly within the past year. We are aiding the study on physical stability of frozen milk in the University of Minnesota in collaboration with the dairy industry, represented by the American Dairy Association. The study on variation in temperatures during transport and storage of frozen foods at the Western Regional Research Laboratory in Albany, Calif., will be of very great interest to us and also to rail, steamship and air lines.

The project on pear storage, the effect of ethylene concentration and the possibility of air purification for pears at Oregon State College is one that our industry and also pear growers are watching with interest. The studies on popcorn at Iowa State College, candy, pecans and peanuts in the Georgia Agricultural Experiment Station in active cooperation with the National Confectioners' Association, and cheese in the University of Wisconsin, are all studies in which the commodity industries have lent their experience, aid and encouragement to the storage-industry leaders who have approved and are supporting the research. The orange storage studies, now well along and highly successful in terms of applicable knowledge, have had whole-hearted cooperation of the Florida citrus industry. Similar industrial cooperation permeates the projected investigations of refrigerated storage of Texas grapefruit and California lemons.

Those are the projects that have received support most recently. A number of older projects are still under way. They are the studies on fresh and frozen shrimp at Louisiana State University, the work on atmospheric moisture and its determination in freezer temperatures at Northwestern University, the project on frozen pork at Kansas State College, the commodity and environmental heat-transfer studies at Columbia University, and those on frozen eggs at Ohio State University, thermal characteristics of fresh and frozen foods at University of Texas, and chemical control of surface bacterial action on refrigerated foods at Oregon State College.

For these and for the older projects (now closed) the reports of achievement have been made before. The studies on dried fruits, frozen eviscerated poultry, frozen pack juices, and certain vegetables, white potatoes, apples, precooked frozen foods and meats, and on sanitation, air purification, carbon dioxide treatment, and air circulation in storages, have yielded varying degrees of basic and practical information.

Also, the results of projects in one commodity field have more than once been useful in solving problems in an entirely different direction. This is characteristic of accumulated technical information. Such facts do not just come into being and then expire or lose their meaning. As the stockpile becomes larger through the years, industrial ability to solve problems and plan action intelligently grows in geometric ratio.

The Future

We have needed this information. We have used it and others have used it in a number of ways. We are fortunate in having it and we need more, for it represents the frontier of industrial progress—a way that we must chart and follow, where no one has gone before.

The future of refrigeration research depends on how much we ask questions—all of us—and on how competently we go about finding the answers. And the nature of the question counts—it must be one of importance and it must be one whose answer will contribute to industry experience and lead to industrial action.

Instead of taking refrigerated warehouses for granted, or not even being aware of their essential service to the food economy, people are becoming increasingly impressed by the importance of these refrigerated establishments in protecting America's perishable foods.

It has taken many years for the American people to realize this, mainly perhaps, because the consumer of foods does not usually come in direct contact with the refrigerated warehouse. Until frozen foods achieved nationwide popularity, the purveyors of perishable foods in advertising their products have stressed quality without telling how such quality was obtained. The refrigerated warehouses through the years have had few, if any, press agents. Their individual inclination, as well as the nature of their business contacts, have not developed aggressive merchandising tactics which characterize some industries whose products and services seem, by skillful promotion, to be absolutely essential to American life.

Refrigerated warehousing is today a technical business of considerable complexity. As such, it merits and can demand the respect and recognition of the American people, which could not eat as they do without its indispensable services in protecting perishable foods.

The Foundation has still newer projects in mind—enough to keep us busy for a long time. It is inevitable that the refrigerated warehouse industry will continue to seek the best possible means of solving its technical problems to the end that its essential services, now increasingly recognized in the national economy, will be based on most modern scientific concepts joined with industrial experience.

A Practical Solution to Accurate Refrigeration Storage Costs

Part III

Checks on Tonnage Calculations Against Engine-Room Performance and Distribution of Power Expenses

By

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Consulting Industrial Engineer
New York City

and

James W. Straub
Comptroller Merchants Refrigerating Co.
New York City

IN PART I of this series the methods used for finding the dead load losses of a plant were discussed at length and the results of the calculations for our sample storage plant were given in terms of tons of refrigeration per day for two different mean outside temperatures—30 F and 80 F.

These figures must now be converted to what they would be for a standard month and for any foreseeable outside temperature condition. Since there are 30.4167 days in our standard month, multiplication of each reading by this figure will give the tons of refrigeration per standard month for coolers, freezers and sharp freezers for the temperatures indicated.

Part III of a Series

This third article in the series on cold storage costs tells how to evaluate space loads in tons refrigeration and convert these loads to power consumption data. Methods are suggested for checking with actual plant performance.

The simplest method of finding the dead load losses for any given mean outside temperature is a graph such as Chart 2. This was drawn for our sample house. The range selected—20 F to 90 F—covers any mean outside temperature likely to be met in the locality of the plant according to the Weather Bureau's reports for some years past. The monthly tonnage figures for coolers, freezers and sharp freezers were then plotted for the two known temperatures and straight lines drawn through the points for each class of space. The resulting graph can be used to find the tons of refrigeration needed for a month to counteract the dead load losses for each kind of space and for any mean outside temperature within the range selected.

Because these losses as a group are those which must be met in order to keep the various classes of storage space at their required temperatures we shall from now on call them *space loads*.

With our space load data in available form and with the commodity loads developed in Part II we are ready to complete our refrigeration load requirements for the month of August. The mean outside temperature reported by the Weather Bureau for that month was 77F. and reference to Chart 2 shows that the space loads for coolers, freezers and sharp freezers for that condition are 383, 649 and 77 tons of refrigeration respectively.

These are the first figures entered in Form 6 where we will convert tonnage requirements to equivalent horsepower-hours and finally distribute the power bills for the month to the various expense accounts.

The next entries in this form are the commodity loads, which are picked up from Forms 4 and 5. When we have calculated the percent distribution of the tonnage load in each class of space we have completed our figures for the month in this unit. From this point on we will be concerned with the power required to produce the needed refrigeration.

As a preliminary for this work an inventory should be made of all electrical equipment in the plant and the essential data for each kept in a register as a permanent record. A form is not shown because any book with a sufficient number of columns can be used for this purpose. The best arrangement is to group all motorized equipment by classes—compressors, exciters, circulating fans, pumps, elevators, etc. The columns could appropriately be headed as follows:

INVENTORY OF ELECTRICAL EQUIPMENT

Kind of Machine
Name of Manufacturer
Serial Numbers of Machine & Motor
Electrical Data
  AC or DC
  No. of Cycles
  No. of Phases
  Voltage
Ratings
  RPM (Revolutions per minute)
  HP (Horsepower)
  GPM (Gallons per minute—for pumps)
  FPM (Feet per minute—for elevators)

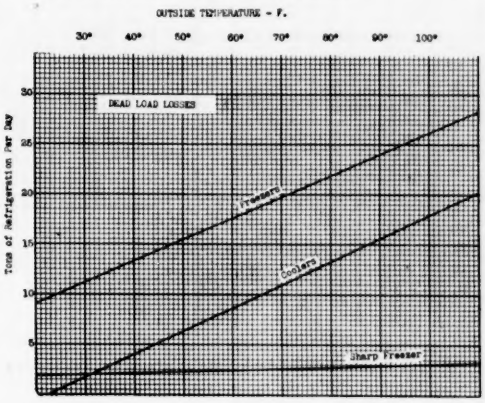

Chart 2 gives dead load losses in the different types of spaces at various outside temperatures.

Form 6 provides for accumulation of refrigeration load data and apportionment of power.

REFRIGERATION DATA WORK SHEET & POWER EXPENSE DISTRIBUTION VOUCHER

MONTH AUGUST

ENGINE ROOM OPERATING CONDITIONS

	COOLERS			FREEZERS			SHARP FREEZERS		
PRESS	SUCTN	INTER	DISCHG	SUCTN	INTER	DISCHG	SUCTN	DISCHG	
MO. AV.	25		115	2.1	25	115	-10" Hg.	2.1	
STAGE	1ST	2ND	TOTAL	1ST	2ND	TOTAL	1ST	2ND	TOTAL
H.P. PER TON	.87		.87	.90	.87	1.77	.51	1.77	2.28

NOTE: THE SECOND STAGE OF THE SHARP FREEZER IS THE TOTAL HP OF THE FREEZER.

POWER BILLS

		A. C.	D. C.
DATES	FROM	July 25	
	TO	Aug 22	
TOTAL DOLLAR AMOUNT BILLED		$ 1,426.02	$
TOTAL K.W.H. BILLED		122,600	
COST PER K.W.H. IN CENTS		1.16 ¢	¢

SPACE & LOADS

		TONS OF REF'G'N FOR MONTH	%		EQUIVALENT HORSEPOWER-HOURS PER TON	FOR MONTH	%	
COOLERS	SPACE LOAD	383						
	COMMODITY LOAD	410						
	TOTAL COOLERS	793	33	3	.87	16,558	19	2
FREEZERS	SPACE LOAD	649						
	COMMODITY LOAD	773						
	TOTAL FREEZERS	1,422	59	6	1.77	60,407	70	1
SHARP FREEZERS	SPACE LOAD	77						
	COMMODITY LOAD	92						
	TOTAL SHARP F.	169	7	1	2.28	9,248	10	7
SUMMARY	COOLERS	793						
	FREEZERS	1,422						
	SHARP FREEZERS	169						
	TOTAL	2,384	100	0		86,213	100	0

METER READINGS FROM ENGINE ROOM LOG

METER FOR	READINGS KWH	AVER. MO. KWH
COMPRESSORS, ETC.	86,446	84,819
BRINE PUMPS	14,601	14,326
FANS & ELEVATORS	8,992	8,823
LIGHTS	9,874	9,688
MISCELLANEOUS		
TOTAL	119,913	117,656

CHECKS: Ammonia Check

$\frac{1,517,775 \text{ lbs. } NH_3}{607.7}$ = 2,498 tons

2,498 tons X .98118 = 2,451 tons

K.W.H. AND POWER BILLS DISTRIBUTION FOR MONTH

	COMPRS-EXCITERS COND. PUMP	BRINE PUMP	FANS	ELEVATORS	LIGHTS	MISC.	TOTAL K.W.H.	AMOUNT DOLLARS	CHARGE TO ACCT.
COOLERS	16,285	3,900	8,000				28,185	$ 326 95	E3322
FREEZERS	59,458	9,826					69,284	803 69	E3322
SHARP F	9,076	600					9,676	112 24	E3322
WHSE. O-H					600		600	6 96	E3022
ADMIN. O-H					1,100		1,100	12 76	E1122
HANDLING				823	7,988		8,811	102 21	E3122
TOTAL	84,819	14,326	8,000	823	9,688		117,656	1,364 81	

RECAP OF POWER EXPENSES FOR MO.

ACCOUNT CHARGED DESCRIPTION	NO.	AMOUNT
GEN'L OFFICE LIGHTS	E1122	$ 12 76
WHSE. OFFICE LIGHTS	E3022	6 96
HANDLING LIGHTS	E3122	102 21
COST OF STORAGE SALES	C 020	1,242 88
CREDIT		
POWER CONTROL	E 22	$1,364 81

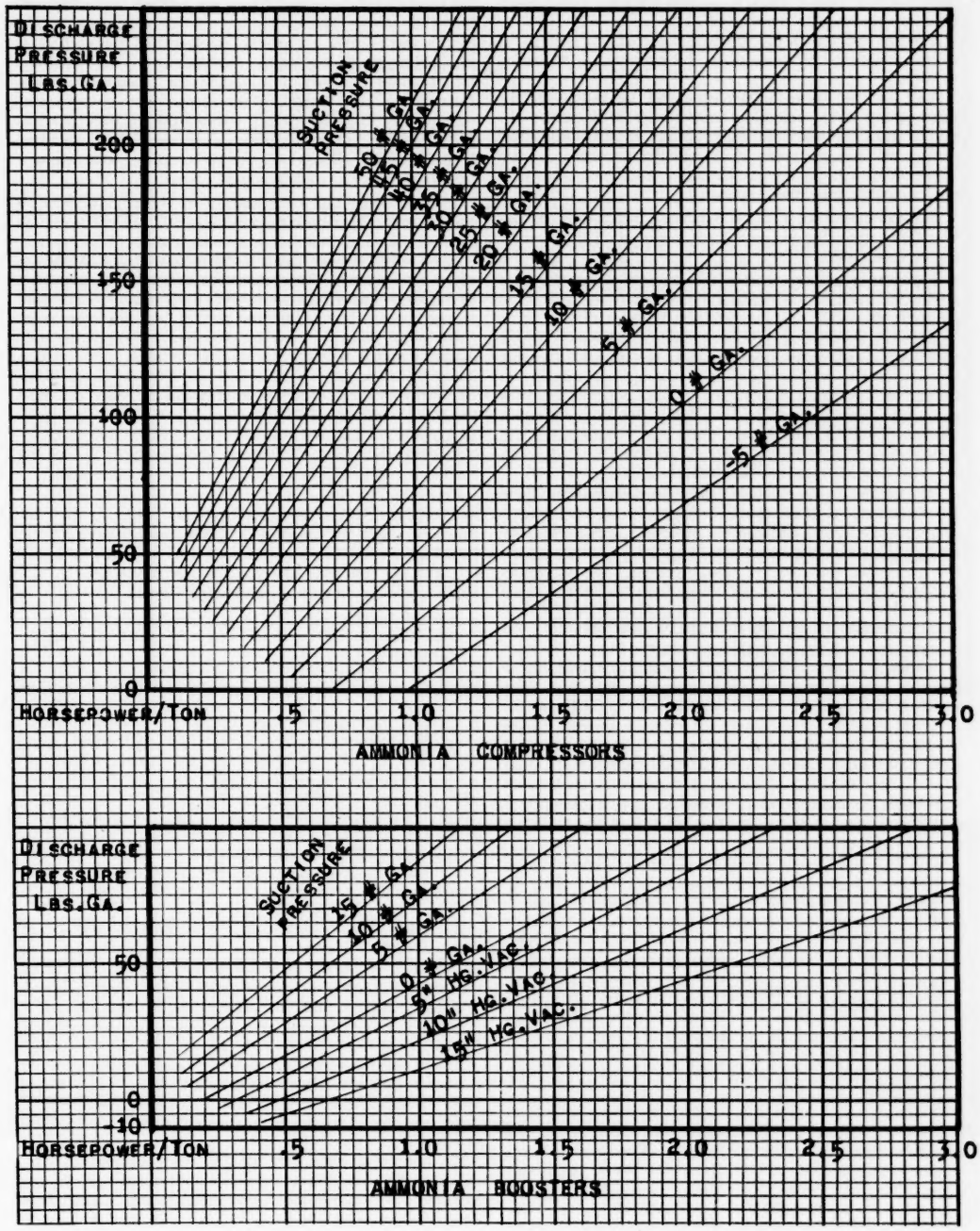

Chart 3—Horsepower per ton of refrigeration for ammonia compressors and boosters.

What Used For (Cooler brine circulating pump, condenser water pump, high temperature brine compressor, or other appropriate description)

Average No. of Hours Operated per Day (This is, of course, somewhat of an estimate and may vary from season to season)

Most of the above information can be found on the name plates of the machines and motors or it can be obtained from the manufacturers. In any event every effort should be made to make it complete and accurate. Once collected it will be readily available and, incidentally, is an invaluable insurance record.

The completion of Form 6 depends largely on information taken from the above record and on data supplied by the engine room.

Were these articles written for the use of refrigeration engineers much of the explanation which follows could be omitted. However, because refrigeration cost finding is an engineering accounting problem, sufficient details of the engineering principles involved must be given to enable the accountant who has not had engineering training to follow the procedures outlined. Space does not permit going into these matters in great detail, but the accountant connected with a cold storage plant can always appeal to members of the technical staff for needed information on any point which may not be perfectly clear.

The figures under Engine Room Operating Conditions are based on readings made from gages on the various compressors. Each machine is equipped with two—one which indicates the pressure on the intake or suction side and the other that on the discharge side. The discharge pressure is usually quite a bit higher than the suction pressure and is measured in pounds per square inch, called simply pounds of pressure. The suction pressure, for reasons we nood not go into here, is quite frequently read in inches of mercury—see suction pressure under Sharp Freezers where the pressure is recorded as -10 in. Hg, which is read minus ten inches of mercury, Hg being the chemical symbol for mercury. In order to convert inches of mercury to pounds per square-inch the multiplying factor is 0.4912, but it is sufficiently accurate to take one-half the reading in inches of mercury as equivalent to pounds per square-inch. When the suction pressure is such that a vacuum is created on that side of the compressor, the reading is negative—as in the given example.

With two factors known—the suction and the discharge pressures—we are able to determine the horsepower per ton of refrigeration developed by a compressor. The manufacturers of these units supply tables giving this information. Chart 3 shows in graphic form the data for the two different types of machines which were operating in our sample warehouse during the month of August.

In order to fill in the information called for under Engine Room Operating Conditions we need the average pressures for the month. In the particular warehouse we are considering very complete logs are kept so that the average of the hourly readings for the month were easily calculated.

The compressor supplying refrigeration for the coolers is operated with but one stage, so that we can find the horsepower from Chart 3 very easily. The freezer compressor set-up is more complicated. It is operated in two stages. The intermediate pressure is both the discharge pressure for the first stage and the suction pressure for the second. With this clue it will be seen how the two horsepowers per ton have been found and then added to give the total for that operation. The sharp freezer compressor is hooked up as a booster with the freezer compressor. Its first stage is found from its suction and discharge pressures and its second stage is equal to the total figure for the freezer compressor.

The next step is to enter the horsepower per ton figure for each class of space in its proper column under Equivalent Horsepower-Hours. To find the correct figure for the month the number of tons of refrigeration for each class of space is multiplied by the horsepower per ton and then by 24 hours in order to complete the calculation. When the total has been found and the percent distribution worked out, this phase of the form is completed. Note particularly the shift in the percent of horsepower-hours required in the different classes of space as compared with the tons of refrigeration in each group of rooms.

In calculating the loads carried by the engine room by the methods described on Parts I and II we made certain assumptions and used some average figures. Is there any way by which we can check our results with actual engine-room performance? Several checks are possible, but those available in any given plant depend upon the records kept in the engine room and these in turn depend upon what meters and thermometers are installed for recording data either automatically or by readings taken and written down by the engine-room personnel. The flows and temperatures of three different liquids can be used, provided the instruments are on hand to supply the necessary data. In a plant such as we are considering where the refrigerant is ammonia and circulating brine is used to cool the rooms, we can use any or all of the following checks.

Check by Condenser Water: If we know the flow of condenser water, either in gallons per minute or in total for the period and the average temperatures of the water on entering and on leaving the condenser we can calculate the number of tons of refrigeration developed in the engine room by one of the following formulas:

Tons of Refrigeration per Mo.=1.262 x gals. water per min. x degrees difference in temp. between discharge and intake.

or, if the total flow of water for the period is known, rather than the flow per minute, the formula to use is:

Tons of Refrigeration per Mo.=Gals of water for month x degree diff. in temp. x conversion factor for mo. and the whole divided by 34,704.

Circulating Brine Check: These same formulas can be used for checking the tons of refrigeration by means of brine flow and temperatures with the following changes. Wherever gallons of water are indicated substitute gallons of brine and, of course, the temperatures must be those of brine returning to and leaving the brine cooler. In the first formula, for the constant 1.262 substitute 1.066, and in the second, for 34,704 substitute 41,040.

Ammonia Flow Check. This calculation is somewhat simpler. All we need to know is the number of pounds of ammonia flowing through the system during the given period. The following formula applies:

Tons of Refrigeration per Mo.=Lbs. of Ammonia for month x conversion factor for month and the whole divided by 607.7.

In our sample form this last method has been used to check our figures for the month. Note that the results check quite closely. It is not expected that these will always tally, but any variation of 10 percent should be investigated.

We have now completed the figures covering the distribution of horsepower in the plant and are ready to consider the cost phase of our problem. Form 6 is used to calculate the amounts to be charged to our various expense accounts because of power purchased from outside sources. Should a plant generate its own electrical energy the whole question of power expense distribution would have to be treated quite differently, although when the cost of power had been developed, its distribution

(Continued on page 88)

Packing House Treatment of Michigan Peaches

By

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In the October issue, an article by Prof. Cardinell discussed the results obtained from a study of Stericooling peaches before loading in pre-iced refrigerated railway cars. It was found that this process resulted in a saving of ice in transit, it saved fan-precooling time and saved the cost of pre-cooling loaded fruit with removable fans.

The accompanying article gives detail data from studies made by the Michigan Agricultural Experiment Station to bring peaches of the best quality to the consumer and maintain longer market life for these peaches. Although other factors are involved it is evident that harvesting of peaches should be followed as quickly as possible by rapid chilling, germicidal treatment and continued protection with refrigeration.

The investigation was made possible by a grant-in-aid from the Research Department, National Association of Ice Industries and the cooperation of a number of other people and agencies.

DURING the past several years Michigan State College has participated in studies to maintain longer market life of the best peaches that the industry has been able to produce. About half of the shipments, on which reports have been made, were delivered, sold and consumed or processed, with high praise for the product. This seems to be the case for the entire nation as judged by a recent report (1) of 2,258 carlots of peaches that were inspected out of 40,000 carlot arrivals in the world's largest market, New York City. During that eight-year period (1935-42) 1,129 carlots showed no decay worth noting. The other 1,129 inspected cars averaged 3.8 per cent decay. Why some shipments are marketed without loss and other shipments develop an appreciable loss is a problem that baffles the peach industry.

So many factors are involved in growing, harvesting, grading, packing, transporting and merchandising each year's peach crop that all cannot be studied at any one time or place. Michigan, like other peach-producing states, has continuously experimented to reduce peach spoilage and to increase the reputation of the product.

In 1947 the first test shipments of Michigan peaches that had been stericooled with ice-water and a germicide, were reported (2). The test was made possible when the Millburg Growers Exchange installed a patented machine known as a "Stericooler" [1]. They treated and shipped 7,128 packed bushels that season and in 1948, 8,792 bushels of peaches were put through their Stericooler. In the 1947 studies, the effectiveness of this new process was compared with the common packing-house practice of dusting the fruit with sulfur as it is "defuzzed" in the brushing machine. All of the tests for the control of peach decay were made after a lapse of 7 and 11 days after the fruit was packed, in order to simulate the effects of long-distance shipments and cold storage holding.

Results of Packing House Treatment

Virtually all of the Stericooled fruit from Southwest Michigan in 1947 and 1948 was shipped to distant markets. The method of rapid cooling described herein quickly removed the field heat, retarded the rate of post-harvest ripening and aided in the prevention of spoilage losses. High quality fruit resulted in increased marketability at its destination and buyers apparently felt justified in paying from 25 to 75 cents per bushel premium for Stericooled peaches.

After the rush of the peach pack began to lessen, 23 packed bushels of Elberta peaches were purchased from one of the fruit exchanges in Berrien County. The peaches had been picked on the afternoon of September 16 and were brushed, dusted with sulfur and packed the following morning, September 17. They were marked U. S. No. 1, 2 in. Minimum.

In order to divide the fruit into more samples it was transferred into "Jumbo" baskets, each holding about 50 peaches. This afforded an opportunity to remove all specimens that were much riper than the average, as well as those that were bruised or showed signs of split-pit, worm or rot. This second grading eliminated five bushels of peaches from the original 23 packed bushels, and should have resulted in a more uniform lot of peaches for the trials. These were as follows.

(1) The peaches from 18 baskets were treated by being dipped for 15 minutes in tapwater, containing 100 p.p.m. of Hypo-Clor.

(2) Those from another 18 baskets were treated by being dipped for 15 minutes in ice-water at 32 F.

(3) Fruit from another 18 baskets was treated in a Stericooler. Water temperature was 32 F.; Hypo-Clor was used at 100 p.p.m., for 15 minutes.

(4) That from another 18 baskets was dusted with dusting sulfur at the time of brushing and packing.

After this fruit was so treated it was trucked to Michigan State College and placed in Storage at 32 F. until each examination period. It was decided to remove a portion of the fruit from each treatment and determine the relationship of rot development (a) to peach treatment, (b) time in cold storage and (c) hours out of storage at 75-85 F. The results are presented in Tables 1 and 2.

Table 1 shows a comparison of the four treatments as lots 1, 11, 111 and 1V (column 1) and groups I and II

Extract from Michigan Agricultural Experiment Station Quarterly Bulletin, Vol. 32, No. 1, page 70 to 93 Inc., August, 1949.

1. The "Sterilcooler" is a patented device designed to drench produce with ice-water in which a germicidal agent may be incorporated. When the water is maintained at 32 F. (0 C.) produce loses about 40 degrees of field heat in 10 to 20 minutes, as it is conveyed through the machine.

TABLE 1—ELBERTA PEACHES TREATED AGAINST ROT, 1948
Relation of time in storage to time out of storage

Column	1	2	3	4	5	6	7	8	9	10
Treatment	Lot number	Group number	Sound fruit number	Sound fruit percent	Fruit rotted number	Fruit rotted percent	Total fruit number	Date removed from cold storage**	Hours at 75°F.	Days since harvest
Tap-water plus Hypo-Clor* at 100 p.p.m.	I	I	115	71.0	48	29	163	9/21	96	9
	I	II	100	68.0	50	32	150	9/25	48	11
	Pressure-test after 24 hours out of cold storage, 15.98 pounds Pressure-test after 96 hours out of storage, 4.95 pounds									
Ice-water (32°F)	II	I	105	71.0	42	29	147	9/21	96	9
	II	II	99	67.0	51	34	150	9/25	48	11
	Pressure test after 24 hours out of cold storage, 15.98 pounds Pressure test after 96 hours out of cold storage, 5.50 pounds									
Stericooled (32°F) ice-water plus Hypo-Clor* at 100 p.p.m.	III	I	120	81.0	29	19	149	9/21	96	9
	III	II	112	75.0	38	25	150	9/25	48	11
	Pressure test after 24 hours out of cold storage, 15.98 pounds Pressure test after 96 hours out of cold storage, 4.95 pounds									
Brushed and dusted with sulfur	IV	I	108	76.0	34	24	142	9/21	96	9
	IV	II	108	73.0	40	27	148	9/25	48	11
	Pressure test after 24 hours out of cold storage, 15.98 pounds Pressure test after 96 hours out of cold storage, 5.29 pounds									

* Hypo-Clor is the name of a brand of a chlorine-type compound.
** Fruit was harvested Sept. 16, 1948, and packed and placed in cold storage the following day.

(column 2) represent date of removal from storage and hours at room temperature. Indicated also are the percentages of unrotted and rotted fruit and their respective pressure determinations, indicating firmness of flesh, 96 hours after removal from cold storage on September 21. Also shown is the amount of loss from rot in older fruit only 48 hours after removal from cold storage on September 25.

This illustrates two very important points, long known to investigators, fruit inspectors and most fruit buyers but seldom recognized by retailers and consumers, that (a) fresh fruit ripens continuously, even at 32 F., and (b) rot-causing organisms are, likewise, developing in infected fruit. The colder the temperature the slower is the activity.

Peach Ripeness and Pressure-Tests

Table 1 represents the examination of 1119 peaches. The fruit of Group 1 of each treatment was removed from cold storage on the evening of the fourth day, September 21. Twenty-four hours later, when the fruit had approached the temperature of the packing room, a test of the firmness of these peaches was made by means of a standard Ballauf[2] plunger-type pressure tester and 5/16-inch point. In the test small areas of skin were sliced away in four places on each test peach. A reading was taken on either side of the suture and one on either "cheek" or side of the peach. An attempt was made to select peaches for the pressure test that represented the full range of maturity of the entire lot. The average of the pressure tests was 15.98 lbs. and represented a range of 3 to 30 lbs. Four days later at 75 F. a similar pressure test was taken and showed an average test of 5.17 lbs. with a range of 4.95 to 5.50 lbs.

Four days after the fruit was removed from cold storage, on September 25, an examination of 601 peaches revealed that 25.3 per cent of the fruit of all treatments were rotted.

On September 25, the ninth day of storage, fruit of Group II (Table 1, column 2) was removed from cold storage and after 2 days at 75 F. examination showed that an average of 29.5 per cent of the fruit had rotted.

This may be one of the many reasons why some buyers are often reluctant to buy peaches that have been held in cold storage several weeks. In the study previously mentioned (1), where federal inspection was made in New York City on 2,258 carlots of peaches, the report states that, "Decay was most prevalent (10.0 per cent) in peaches from California, some decay being reported in 88 per cent of the carlots inspected from that state; most of it was due to brown-rot . . .; decay in fruit from states other than California ranged from 1.0 to 1.9 per cent." Much of the heavy loss was doubtless due to the eight-to-ten-day haul before the fruit was unloaded in New York.

Nearness to market is truly a measurable factor in the reduction of peach rot. Peaches grown in New York State and having a short haul to New York City, were shown to have only 0.2 per cent rot. Of infected cars showing decay, Maryland peaches had only 0.4 per cent, whereas Arkansas peaches showed 2.6 per cent decay and Georgia peaches had 1.9 per cent decay. Michigan did not have enough carlots inspected in New York City to be included in the study, but very likely it might be expected to fall somewhere between Ohio's 1 per cent and Illinois' 1.3 per cent decay. Receiving point inspection was obtained on 12 carlots of Michigan peaches shipped from Benton Harbor, Mich. to New York City. Regardless of the fact that these cars were not inspected until the 4th, 6th, 7th and 8th days after leaving their point of origin, an average of less than 1 per cent decay was reported under federal inspection. The fruit was packed at Hartford, Millburg, Coloma and Sodus and should represent a cross-section of southwestern Michigan peaches.

Also, it was grown and shipped during a near-record year for severity of brown-rot. Here is proof that the first eight days under refrigeration showed the least loss. The subsequent spoilage prior to consumption is reported elsewhere (4).

Table 2 represents a comparative study of treatments based on examination of 2,364 fruits for peach rot, made at intervals of 0, 24, 48, 96 and 144 hours after removal from cold storage in 1948. In this case all the baskets were removed from cold storage the evening of September 28. After 12 days at 32 F. the fruit would have been classified by the trade as hard-shipping maturity. An average of 80 punctures of peeled flesh of 20 peaches by means of a 5/16-inch point on a standard pressure-tester, showed a firmness of 16.4 pounds.

With Group III (Table 2, column 2), the number of peaches injured by rots were counted within 2 hours after

2. D. Ballauf Mfg. Co., 621-H. Street, Washington, D. C.

TABLE 2—ELBERTA PEACHES TREATED AGAINST ROT, 1948
Relation of lapsed time to treatment and control

Column	1	2	3	4	5	6	7	8	9	10
Treatment	Lot number	Group number	Sound fruit number	Sound fruit percent	Fruit rotted number	Fruit rotted percent	Total fruit number	Date removed from cold storage**	Hours at 75°F	Days since ¶ harvest
	I	III	144	97	5	3	149	9/28	000	12
	I	IV	132	92	13	8	145	9/28	24	13
Tap-water plus Hypo-Clor* at	I	V	66	69	30	31	96	9/28	48	15
100 p.p.m.	I	VI	39	39	61	61	100	9/28	96	17
	I	VII	20	19	85	81	105	9/28	144	19
					Average	37				
	II	III	187	97	6	3	193	9/28	000	12
	II	IV	135	92	12	8	147	9/28	24	13
Ice-water (32°F)	II	V	46	54	39	46	85	9/28	48	15
	II	VI	23	22	80	78	103	9/28	96	17
	II	VII	20	19	83	81	103	9/28	144	19
					Average	43				
	III	III	148	98	2	2	150	9/28	000	12
Stericooled (32°F.) ice-water	III	IV	126	89	16	11	142	9/28	24	13
plus Hypo-Clor* at 100 p.p.m.	III	V	55	63	33	37	88	9/28	48	15
	III	VI	54	58	40	42	94	9/28	96	17
	III	VII	28	29	69	71	97	9/28	144	19
					Average	33				
	IV	III	143	98	3	2	146	9/28	000	12
Brushed and dusted with sulfur	IV	IV	128	92	11	8	139	9/28	24	13
	IV	V	52	59	36	41	88	9/28	48	15
	IV	VI	26	26	75	74	101	9/28	96	17
	IV	VII	16	17	77	83	93	9/28	144	19
					Average	41				

** Hypo-Clor is the name of a brand of a chlorine-type compound.
* Fruit was harvested Sept. 16, 1948, and packed and placed in cold storage the following day.

removal from cold storage. An average of 2.5 per cent rot had occurred after 12 days in cold storage. Twenty-four hours later, the fruit of Group IV (column 2) showed an average of 8.5 per cent rotted fruit. This was an increase of 6 per cent rot in 24 hours. By the time the fruit of Group V had been out of cold storage 48 hours, the average of all treatments was 38.8 per cent rot. After 96 hours, rots had increased until 63.5 per cent of the fruit was involved. On the sixth day (144 hours) out of storage, rots had accounted for an average of 78.5 per cent of the peaches of Group VII (column 6). It should be remembered that this fruit had been graded twice to make it more uniform.

Table 3 shows, by treatment, the average percentage loss due to peach rot from the 12th through the 19th day after harvest.

In the 1947 study (2) the germicidal agent, Hypo-Clor, was used at 130 p.p.m., whereas in 1948 it was used at 100 p.p.m.

Table 3 is a summary of the average of each group number (from Table 2, column 2), representing the number of hours out of storage as shown in column 9, for each treatment.

TABLE 3—SUMMARY OF THE AVERAGE LOSS BY ROT, 1948
TREATMENT IN RELATION TO LAPSED TIME

	Average rot loss groups III to VII (Ave. 12 to 19 days after harvest)
	Percent
Lot I—Tap-water plus "Hypo-Clor" at 100 p.p.m.	37.2
Lot II—Ice-water (32°F)	42.6
Lot III—Stericooled (ice-water 32°F. plus Hypo-Clor at 100 p.p.m.	32.6
Lot IV—Brushed and dusted with sulfur	41.2

Lots I and III were treated alike, in that they contained a like amount of the same germicide. Since these treatments showed the lowest amount of waste from rot, it indicates that some benefit resulted even from the 12th to the 19th day after harvest. The treatment given Lot III (Stericooled) produced the best results, as was true in 1947. It seems to have been due primarily to the germicide rather than to the hydrocooling, since hydrocooling alone, shown as Lot II, gave the poorest control. This is logical, since hydrocooling provided refrigeration for only a few hours. It is interesting to note that tap-water (60 F.—Lot I) plus the germicide gave slightly better average (37 per cent rot) control of peach rot than did hydrocooling alone (43 per cent rot—Lot II). The brushed and sulphur-dusted treatment, the standard procedure against rot in most packing-houses, ranked third and was only slightly better than hydrocooling. In similar trials made in 1947 (2) it is notable that the Stericooled fruit showed much better results without further refrigeration than was indicated by comparable packs, which were dusted at the grader with sulfur and "Zerlate" and, likewise, given no refrigeration.

In both seasons the limited tests strongly indicate that the prophylactic treatment with the chlorine compound reduced loss from rots far more effectively than did dusting sulfur.

Peaches that stood in ice-water containing no germicide until they reached a temperature of 44-46 F. had the highest percentage of rot. This bears out the findings of Brooks and Cooley (3) more than 20 years ago, that, "Wetness probably also hastened germination and facilitated infection." A fungicide appears to be essential before or after the packing operation, regardless of subsequent temperature.

This is a long way from perfect protection but the 5- to 10-per cent better control, 12 to 19 days after harvest, is a welcome adjunct to marketing better peaches. Better germicides may be discovered, and much stronger strengths of the same germicide may prove safe on peaches.

Uneven Maturity in Peach Packs

It is quite common to hear or read references to "marketing problems" and "production problems." It is seldom simple to separate one from the other. As a matter of fact, many of the problems in marketing can mainly be corrected on the farm and in the packing house. Likewise, many production problems can be solved on the farm if it could be assured that markets would pay for the improvement or change. These statements apply readily to fruit-sizing, grading, packaging and to such treatments as Stericooling.

One very disturbing factor that has not been given sufficient consideration is the matter of uneven maturity in almost any package of peaches.

From commercially packed bushels of Michigan Elberta peaches, the authors selected at random several bushels to be placed in cold storage and brought out at intervals for examination and testing by means of a standard Ballauf piston-type pressure tester.

The fruit, as previously stated, had been picked on September 16, 1948, was packed on the following day, and placed in cold storage at 32 F.

After being in cold storage 5 days until September 21, one lot was allowed to attain the temperature of the packing room for 24 hours, which was 56 F., night average and 62 F. day average. On September 22, six days after harvest, 10 peaches were tested for firmness. The average of the 40 readings was 15.98 pounds per peach. The range varied from 3 pounds to 30 pounds, or the full range of the pressure-tester scale.

Of the 10 peaches, 5 showed readings much below the others. These five had a range of 3 to 15 pounds, with an average of 8.9 pounds. The test readings of the firmest five averaged 23 pounds.

Another lot of Elberta peaches was held at 32 F. for 12 days after being packed. Ten peaches were tested at random. Of the 40 readings the average was 19.2 pounds pressure to puncture the flesh. Three peaches indicated, by the color of the skin, that they were much more mature than the other seven. Their average was only 4.8 pounds. Except for the three specimens the remaining seven peaches averaged 25.4 pounds, obviously, very hard peaches even after 12 days in cold storage.

The final lot was removed from 32 F. cold storage after 13 days and was held at 75 F. room temperature for 2 days. After this treatment the peaches were soft ripe and showed an average pressure-test of only 3.7 pounds. Of this lot, one peach was much firmer than all the others. It tested 6.3 pounds. This last lot had reached the stage considered by most home canners as ideal maturity for peeling. Except for the one firmer peach, the rest were near the minimum pressure recordable by the pressure tester.

These pressure tests were taken in connection with other treatments and, therefore, a study of the degree of firmness as related to spoilage was not a part of this study. The pressure tests, however, show that a certain proportion of firm-ripe shipping peaches become mixed with a lot of the very hardest fruit. It is, therefore, easier to understand why, after several days, in transit, in storage and in warm stores that a portion of the softer fruit may become bruised and infected long before the hard specimens have reached even the "firm-ripe" stage. Perhaps it is the contact between firm fruit and the soft and diseased specimens that allows premature infection of hard, green peaches, even in cold storage.

In connection with these trials, it has already been stated that market appraisal of peaches so treated was obtained by inserting approximately 20,000 post cards in packed bushels. The replies from 944 dealers and housewives have already been reported. (4)

That study, among other items, reveals the seriousness of the problem of packing peaches of various degrees of ripeness within the same package, as expressed by the dealers and housewives who reported the condition. The study indicates that, "In the case of peaches rated as 'too-ripe', the average waste was one-fourth, while in the case of peaches rated 'about right,' less than one-tenth was reported as the average waste. The greatest amount of bruising was found in peaches which customers marked as being 'mixed-ripe and green.' In the case of peaches classified as being 'mixed-ripe and green' the amount of bruising was almost double the average given for each of the four other groups. This mixing of peaches of different degrees of ripeness in the same containers appears to greatly aggravate bruising."

Skin-Color and Pressure Tests

As one observes fruit rolling, hour after hour, into the packers' bins after being sorted and divided for size, it becomes evident that there are several degrees of maturity going into each package.

In 1947, Elberta peaches were separated by sight into four degrees of color as indicated by the ground-color or the non-red pigment portion of the skin of each peach. After dividing the fruit into four color groups, each group was tested for firmness of the peeled flesh by means of a pressure-tester with a 5/16-inch point. These tests are shown in Table 4.

TABLE 4—FIRMNESS OF FLESH AS RELATED TO COLOR OF SKIN, ELBERTA

Skin color (under-color)	Trade terms	Pressure test when packed average pounds	Pressure test after 7 days at 75°F. average pounds
1. Leaf green	Green	28	14
2. Greenish-yellow	Hard-ripe	22	13
3. Sulfur yellow	Firm ripe	18	9
4. Amber yellow	Tree ripe	13	6

The peaches were separated into four classes in the order of apparent ripeness: (1) leaf green, (2) greenish-yellow, (3) sulfur yellow and (4) amber yellow. As a guide to color, the "Peach Harvest Color Standards" used by Coe in Utah (5) were used in the Michigan studies.

All of these peaches had passed the persons who were sorting in accordance with the standard of the packing house. These peaches, except the few bushels taken out for this test, went into commercial packs. In fact after this lot had been packed, 25 bushels were purchased and used in the treatments.

The pressure tests verified the degrees of maturity that the eye detected. In general, the greener the under-color of the skin the firmer was the flesh beneath the skin. This ratio was not only true at the time of packing but also 7 days later at "store" temperature.

The solution of the vexing problem of grading fruit to a more uniform separation of firmness is by no means easy, on a low-cost commercial basis. Perhaps it cannot be rapidly done, economically, until electronic color graders can be perfected. In the meantime trained fruit pickers can do the most in picking the ripest fruit first and keeping

it separate from the firm-ripe and hard fruit. Packing houses try to separate grower loads as to ripeness, but it is little short of impossible to separate peaches of varying maturity once the fruit reaches the sorting belt. This appears to be a problem that only supervised picking can now correct.

The conclusions reached by Morris reporting on a five-year study on "Peach Maturity at Harvest as Related to Quality" can scarcely be better stated on the question of determining color and firmness. He reported in 1932 (6) that, "Pressure tests cannot be used independently of other methods in determining harvest dates or selection of fruit to be picked. They can often be used to determine the color standards for each picking. At any one date from the beginning of the picking season, peaches of extreme hardness and extreme softness may be found on the same tree attached to the same type of twigs located in the same sections of the top. . . . A combination of pressure tests and color seems to be the best method of arriving at a standard or gauge to use in harvest work. . . . Adequate maturity of peaches is necessary for the attainment of highest quality. Complete maturity of the fruit before picking will prevent its shipment to distant markets without heavy loss. The fruit that is still hard and green when harvested will endure rough handling in packing and will show less picking and shipment injury than the fruit of more advanced maturity. The green fruit, however, is of very inferior quality when ripened, and is unattractive for use even when soft enough for eating out of hand or for culinary purposes." This problem is continually being investigated.

A study of, "factors other than palatability which are important in determining acceptability of peaches", was reported in 1948 by Cravens and Paul (7). They stated that, "These data confirm, in general, the judges' conclusion that tree-ripe peaches were superior for 4 days after harvest, and firm-ripe peaches were better for storage periods of 6 to 9 days. The firm-ripe peaches did not develop the attractive external color of the tree ripe peaches, while the hard-ripe peaches were still quite green at the end of the storage period."

On the question of flavor, texture and color those authors state that "The qualities scored were those considered by the housewife in determining the acceptability of any given lot of peaches. . . . The results indicate that the tree-ripened peaches were much more acceptable at 2 days after harvest than were the firm-ripe or hard-ripe ones.

At 4 days, the tree-ripened peaches were still slightly more desirable than the firm ripe peaches. Six days after picking, the firm-ripe peaches were more acceptable than the tree-ripe, and as acceptable as the tree-ripe peaches had been at 2 or 4 days. At 9 days the quality of the firm-ripe peaches was again highest. At no time did the quality of the hard-ripe peaches equal that of either tree-ripe or firm-ripe peaches."

Discussion and Summary

From a casual review of the extensive literature pertaining to the causes of spoilage of peaches in transit and in marketing, it is evident that many factors are involved. Seemingly, there are two periods for attacking the causes of decay. One is the control of brown-rot fungus through a complete program of orchard sanitation and adequate protection by applications of spray material. The other is through careful harvesting of fruit of uniform maturity and quick and adequate refrigeration and, if possible, coating all surface of the fruit with an approved and safe fungicide. Very likely the sooner the harvested fruit is treated and subjected to 30 - 40 F., the more effective should be the preventive treatment.

The other zone is primarily in the packing house, in transit and until peaches are consumed or processed and is directed against black-mold rot (Rhizopus) and blue-mold rot (Penicillium) as well as against brown-rot spores. Spray materials applied in the orchard seemingly have no effect against these two post-harvest diseases, black-mold and blue-mold. Thirty years ago it was stated, "With all the rots, temperature has been an extremely important factor. . . . Rhizopus (black-mold rot) was entirely eliminated at the lower temperature (41 F.) and Penicillium (blue-mold rot) and Monilia (brown-rot) were greatly reduced" (2).

These three diseases of harvested peaches can only be prevented and arrested by the quickest possible refrigeration, once the fruit is off the tree. Germicidal treatments appear to be most beneficial against decay after fruit leaves refrigeration.

The packing-house treatments herein reported were attempts to measure the effectiveness and cost of rapid precooling by hydro-cooling. The results 4 to 8 days later in carlot shipments of fruit Steri-cooled before loading were contrasted with identical shipments of warm loaded fruit, dusted with sulfur.

Since most shipments under adequate refrigeration show very little decay at destination it was necessary to obtain replies from retailers and housewives, who purchased Michigan peaches treated in these tests. This was done by inserting a consumer post card in some 20,000-bushel packs from three packing houses, two of which operated a Stericooler and one used only sulfur dust in the defuzzing unit. The authors of the market phase of the study (4) comment, "The variation in waste reported by buyers of both Halehaven and Elberta peaches showed a wide variation. Almost two-fifths of the buyers reported less than one pound of waste per bushel due to rot. On the other hand, one-fifth reported 20 per cent or more waste due to rot. Such wide variation in waste due to rot suggests the need for more information concerning methods now used for controlling rot. If one-third of the peaches can be marketed with no more rot than one pound per bushel it should be possible for more to be as successfully grown and handled by the same methods."

The tests in 1948 showed a marked saving in the amount of ice used between Benton Harbor, Michigan and New York City, when freight refrigerator cars were loaded with Stericooled peaches. Loading hydrocooled fruit saved the time and the $15 per car cost of fan-precooling on-track before shipment. This can be important as was demonstrated more than 21 years ago (3) when it was found that, "nearly 60 per cent of the damage done by Monilia (brown-rot) during the given transit periods (ave. 6 days) in either the top or bottom of the car was accomplished during the first 36 hours after the car was closed."

In the Michigan studies (Table 2) the fruit samples from commercial packs were treated in 1) tap-water plus germicide, Hypo-Clor, 2) ice-water, 3) ice-water plus Hypo-Clor (Stericooling) and 4) sulfur dusting of warm fruit. In the work of 1947 (2) and in 1948 can be seen the apparent good results of even 100-130 p.p.m. of the chlorine-type germicide, Hypo-Clor, with or without refrigeration. It also indicates that once removed from low temperature, decay sets in rapidly (Table 2, column 6) regardless of previous treatment. Hydrocooling with Hypo-Clor (Stericooling) at 100 p.p.m., in 1948, resulted in 10 per cent better control of decay than did hydrocooling with ice-water without the Hypo-Clor. These results were obtained after all the fruit had been in cold storage for 12 days and out of storage from 1 to 5 days (Table 2, column 9).

This study also illustrates the relation of time (age of fruit) and temperature to peach spoilage, regardless of treatment. The results indicate that search should con-

tinue for more efficient fungicides and germicides that are safe to use on food.

It should be noted that the fruit used in these experiments had been grown in one orchard. It was under soil cultivation, well pruned, sprayed with a "speed-sprayer" and, in-short, nothing was spared that the most experienced owner could approve. It was picked in the afternoon, hauled to the fruit exchange in the evening and the next morning it was put through the defuzzer and dusted with dusting-sulfur, passed before a sorting crew of 16 women, sized mechanically and packed "face and fill." From this lot on the packing-house floor, the authors purchased 23 bushels. While separating this fruit into smaller, 15 pound baskets, 5 bushels of fruit were removed to eliminate over ripe, crushed, wormy or rot-infected fruit that had escaped the eyes of the sorters.

Regardless of this double sorting, there were too many "ripe" peaches mixed with "green", hard fruit. After five days in 32 F. cold storage, one lot was removed from storage and after approaching the temperature of the room, pressure readings showed that the average of the fruit was 15.98 pounds. Half of the fruit was softer than the other peaches and the soft ones averaged 8.9 pounds. The remaining firmer fruits averaged 23 pounds of pressure to crush the peeled flesh. The former peaches were suited to a short haul or short storage life, whereas, the hard-ripe fruit, after 5 days in storage could, no doubt, have been shipped across the continent and been highly merchantable, so far as firmness was concerned.

Though incidental to this study of some commercial packing-house procedures, the retailer and consumer replies associated with this study have been published in a previous report (4). That report states, "In the case of peaches rated "too ripe", the average waste was one-fourth, while in the case of peaches rated "about-right", less than one-tenth was reported as the average waste. The greatest amount of bruising was found in peaches which customers marked as being "mixed-ripe and green."

Plans have been made to continue certain phases of these complex peach marketing problems during the 1949 season.

Acknowledgment

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Low Temperature is Quality Factor In Prepackaged Sweet Corn

SWEET corn, husked and packaged where it is grown, will arrive at distant markets in prime condition if adequate refrigeration is provided all along the line. That is the conclusion reached by plant scientists of the U. S. Department of Agriculture and the Florida Agricultural Experiment Station in a study made with the cooperation of a Florida grower this year. The work was done under the Research and Marketing Act of 1946.

Prepackaging sweet corn in the production area has several advantages: it offers: (1) an opportunity for quick and efficient cooling, which is of major importance. The high sugar content of freshly harvested corn turns to starch unless the corn is quickly cooled, ideally just above freezing, and held at low temperatures: (2) it permits waste husks and cobs to be used as stock feed and fertiiizer on the farm; and (3) it results in big savings in transportation costs. One truck of prepackaged corn equals about three truck loads of crated bulk corn.

The investigators found that precooling the corn to the desired low temperature required a minimum of 20 minutes in the hydro cooler when the water temperature was from 36 to 38 F. Even though the packaging operations were carried on with speed, from field to cold storage in 45 minutes, the precooled corn warmed up several degrees during packaging. On the basis of this, the specialists say further cooling in storage after hydrocooling is needed before the corn is packaged.

Shipment of prepackaged corn by truck will require improvements in refrigeration, particularly in air circulation in the trucks, the study shows. In test loads, substantial cooling occurred in 3 of 4 mechanically refrigerated trucks but in only 1 of 6 iced trucks. Average arrival temperatures were 43.7 F. for the mechanically cooled and 50.4 F. for the iced trucks. Rapid precooling to 32 to 35 F. and maintenance of these temperatures would result in corn of far superior quality.

Refrigerated Warehousing Industry

NEWS • ARTICLES • ANNOUNCEMENTS

NATIONAL ASSOCIATION of REFRIGERATED WAREHOUSES

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1949 Review of Refrigerated Warehousing — Outlook for 1950

THE refrigerated warehousing industry had a fairly average successful year during 1949 with some leading warehousemen reporting decreased occupancy over the previous year and others who were favored with an increased or about the same occupancy. For 1950 a slight further decline is expected with a probable leveling off some time during the year.

Frozen food products continued as the leading commodity for which there is considerable hope for increased volume in the future, while shell eggs suffered a severe decline in all sections, which is understandable when the government reported December 1 holdings as the all-time record low for December.

Rising costs are still evident, but this problem is being met by better handling methods and in some cases through installation of modern handling machinery.

The following review has been compiled from letters received from refrigerated warehousemen in representative sections of the country.

Space Occupancy in 1949—Volume of Leading Commodities

SPACE occupancy still continued its downward trend with some concerns reporting better or about the same as previous years. Bumper crops in some sections made up in some cases for decreases in other commodities. On the whole, space occupancy during the year and near the close of the year was quite satisfactory. However there is some speculation as to whether 1950 may not show a further slight decline.

Frozen food products continue to shine as the leading commodity and for which there are good prospects of continued increases. Shell eggs presented a different picture, —down in all sections. Meat storage continued on a fairly level basis.

California—Our percentage of occupancy was about the same as 1948, and 1950 prospects indicate little change.

Idaho—Our occupancy for 1949 was about 90 percent of 1948. We expect that 1950 will be somewhat better, probably about like 1948. There is a large amount of federal building in sight here for this immediate vicinity.

Indiana—Our percentage of occupancy for 1948 was about 33 per cent of capacity; whereas, in 1949 the large apple crop gave us sufficient business to enable us to utilize 90 per cent of our total space.

Louisiana—Our percentage of freezer occupancy for 1949 was 73 per cent compared to 91 per cent in 1948. Cooler occupancy was 71 per cent compared to 80 per cent in 1948.

Louisiana—Our percentage of occupancy for 1949 was roughly 15 per cent lower than for 1948. We expect this trend to continue in 1950 slightly further, with a leveling off during the year. The year 1949 was a big step down off of that "war-time peak."

Massachusetts—Occupancy of our warehouses during 1949 was materially higher than in 1948. A bumper cranberry crop in the fall of 1948 was largely responsible for this higher storage average occupancy. Although the quantity of shell eggs stored was very small comparatively, a good apple crop in the fall helped the average occupancy of our cooler space.

New York—Occupancy for the first nine months of 1949 was about 20 per cent off from the previous year. The last three months have seen that occupancy go into a further nosedive, so that at this writing it is running only about 50 per cent.

New York—Our occupancy for 1949 will show somewhat better than it did in 1948. Increased holdings of butter and poultry, particularly of turkeys, account for the improvement.

Ohio—The percentage of occupancy during 1949 was 60 per cent as compared with 80 per cent in 1948. From all indications it looks like 60 per cent for 1950.

Ohio—The percentage of occupancy for 1949 will be 15 to 20 per cent less than 1948. We do not expect 1950 to be any better.

Oklahoma—Our average occupancy for the year 1949 has been 65 per cent. During the early part of the year, we ran under that but the cold storage business generally was pretty much down as we all know. We have, however, since July been increasing our occupancy continuously until, at the moment, I would say we are at least 85 per cent full.

Texas—Our average occupancy for cooler space was 48 per cent for 1949 as compared with 71 per cent for 1948. Freezer space occupancy ran 60 per cent for 1949 as compared with 73 per cent for 1948. These decreases for the year 1949 were principally due to unusual range conditions which allowed the ranchers to hold their cattle to fatten while, usually, they are forced to market them because of dry weather. The high prices that prevailed on eggs and poultry kept the storage of these items to a minimum. We particularly felt the loss of storage of frozen eggs. We hope that changes in the weather and price conditions will enable us to bring up the occupancy next year to equal or exceed the 1948 figures.

Texas—Our occupancy during the first ten months of 1949 was about thirty per cent lower than during the same period of 1948. Conditions have improved since November 15 and we are encouraged and hope this improvement will continue during 1950.

Utah—Our occupancy for the first nine months was 60 per cent, the last three months, 90 per cent.

Washington—The strawberry crop was short all through the Northwest this year making a light pack. Some other items exceeded early estimates and the percentage of occupancy ran fairly high in most houses. The freezing of one-pound packages of red raspberries for retail trade showed the biggest increase of any single item.

Wisconsin—Our percentage of occupancy was not as good in 1949 as it was in 1948. We do not know what to anticipate for next year in tonnage. If our markets develop a sluggish condition due to developments beyond the control of buyer and seller, then we might have less tonnage passing through our doors than if the markets on the different commodities were based on the old law of supply and demand.

Idaho—The volume of leading commodities for 1949 was less than for 1948. We expect a fair business in eggs and poultry in 1950 and more frozen foods.

Louisiana—We find that in 1949 our commodities were more diversified than they were in 1948, and we cannot specify any leading commodity. In fact, our general business is very much diversified, and we do not concentrate on one or two commodities such as eggs, apples, or onions.

Massachusetts—The volume of frozen foods stored was slightly higher than 1948 and this commodity continues to show an upward trend.

Ohio—Frozen food products were the leading commodities for 1949 as compared to 1948. We believe that the frozen food items should increase in volume in 1950.

Ohio—In leading commodities, shell eggs were considerably short in 1949 over 1948. Other leading commodities were off to a small percentage.

Oklahoma—Our leading commodity here is meat from the local packers. The next largest item is frozen fruit and vegetables, and of those we are running about twice the amount we had a year ago. Insofar as I can see, the industrial program is largely a matter of occupancy, and I have the feeling this will gradually take care of itself because of the increased use of public refrigerated warehouses for various commodities. For instance, orange concentrate has been a very large item, and in my opinion, will probably double next year and I think other frozen foods are increasing constantly.

Texas—We had less volume of frozen foods this year than during 1948 but a larger volume is anticipated for 1950.

Storage of Frozen Foods

AN appreciable amount of frozen foods in storage and prospects for increasing volume is reported generally. One suggestion is that refrigerated warehouses would find it advantageous to study their facilities and provide more adequate conveniences for distributors of frozen foods.

California—We had an appreciable amount of frozen foods for storage, as compared to the previous year and we expect an increase in 1950.

Idaho—The consumption of frozen foods and also the storage is increasing gradually here. Next year will probably continue the movement.

Louisiana—We did not get an appreciable amount of packaged frozen foods for storage during the year and we do not expect to get much increase during the coming year.

Louisiana—We received more frozen foods in 1949 than we did in 1948, and we expect an increase in this commodity during the year 1950.

New York—Frozen foods continue to be an important item of storage and should increase in volume.

Ohio—Frozen food commodities increased in volume in 1949 and we expect a larger volume in 1950.

Ohio—For frozen foods (fruits and vegetables) we expect an increase in 1950.

Oklahoma—We are expecting frozen fruits and vegetables to increase during the year 1950.

Texas—Storage of frozen foods increased about ten per cent over the previous year. With new items coming on the market and with the popularity of frozen foods increasing, we believe this type of storage should increase.

Wisconsin—It is hard to anticipate whether we will handle more frozen foods next year than this last year. The one item of orange concentrate improved in tonnage this year but this increase was somewhat offset by a decline in other frozen products.

Costs and Income Developing New Services

IN MANY cases costs were reported up and out of line with income, while in others they were reported satisfactory. New handling methods are reported as one means of reducing costs and in one case a new labor contract calling for more wages was offset by higher rates for handling.

There was a considerable dearth of suggestions regarding the development of new services or products for storage. Those offered however seem to have possibilities: leaf tobacco, green coffee, onions and grapes.

Idaho—Costs were not in line with income. They were higher as compared to previous years.

Louisiana—Costs were in line with income based on the past three years.

Massachusetts—Costs of operation continued high. Mechanical equipment and better output by the men helped to absorb wage increases given each year.

New York—A new labor contract has been negotiated during the year at severe increases in wage scales together with added welfare costs. To meet this increased expense most operators have found it necessary to quote higher rates for handling. Storage rates for the most part have remained unchanged.

Ohio—Our costs naturally were higher as compared to previous years due to increased labor rates.

Oklahoma—Our costs have decreased, but this is due entirely to the handling methods used in our new storage as compared to the old. For instance, our new storage is all on one floor and we use fork lifts and pallets for storing everything in both coolers and freezers, in so far as this new storage is concerned. We do, of course, still handle items in the old multi-story building, without fork lifts or pallets.

Texas—Unionization of our plant during the year caused our labor costs to go up. We have not received comparable increases in our revenues to offset the additional expense. Other expenses were about the same as for the previous year.

Texas—Our costs have continued to rise each year and the minimum wage increase which will become effective during January 1950 will add still more to our costs.

Washington—Wages were at their all-time high in 1949 but costs were held pretty well in line by some new equipment and plant improvement.

Wisconsin—The year 1949 was a rather hectic one from various angles and which will result in a rather poor profit year for us due in part to ever-increasing labor costs, which costs we have not yet been able to recover from the trade.

Louisiana—We believe that the storage of leaf tobacco, and the storage of green coffee in sacks, are potential new commodities in the storage field, in this area anyway.

Louisiana—We understand that the Refrigeration Research Foundation has made some experiments in storing green and roasted coffee in refrigerated warehouses. These experiments, it is expected, will show the decided advantages of storing coffee in refrigerated warehouses. I believe some new business can be developed along these lines.

Oklahoma—I have no ideas or suggestions for developing new commodities for storage. I can say there are certain items which we hesitated to take on this year but I am planning on taking them on during the next year. I refer to onions from Northern Texas and grapes from California. We were offered both items but I was just a little afraid to store either one because of the lack of experience.

The Help Situation

ADEQUATE help, for the most part, was available throughout 1949 and the same condition, it is expected, will prevail in 1950. Some concern however is expressed regarding increasing union demands for pensions and other welfare agreements and it is questioned whether the pattern set by the steel and auto industries can be met in the refrigerated warehousing field.

Idaho—Adequate help is available. There will be in 1950, we expect.

Indiana—We have had no trouble in employing all the help necessary. We don't anticipate any trouble for 1950.

Louisiana—We are completely unionized and have adequate warehouse help. There will be no shortage in 1950; in fact prospects indicate that there will be lay-offs.

Massachusetts—We have had no trouble obtaining a supply of labor.

New York—Help has been adequate. We anticipate no manpower shortage in the coming year.

Ohio—We were able to employ adequate help. The outlook for help in 1950 is plentiful.

Ohio—The help situation was no problem in 1949. We anticipate an ample supply for 1950 too.

Oklahoma—I cannot see that the help situation is too much improved. Unfortunately it doesn't seem to make very much difference what we pay, we still get the same type of worker in general. There are exceptions, however.

Texas—The manpower situation eased up as far as quantity was concerned but the quality hasn't improved much.

Texas—We have found adequate available manpower during all of 1949.

Washington—Good help was more easily obtained in 1949 than in the several years preceding and we think this will again be true in 1950. We installed the pallet and electric fork truck system in two of our warehouses making a considerable saving in handling costs.

Wisconsin—While we anticipate the manpower situation to be easier next year, nevertheless, we look with considerable concern toward the demands that may be made for pension and welfare agreements. The cold storage industry has always been a low return industry, as our industry's record will show for the past thirty-five years, and whether labor's demands for welfare plans can be met by our industry over a period of future years is extremely doubtful if recent agreements set by the steel and auto industry are to be considered as a pattern.

Industry Problems

THE items constituting industry problems remain about the same as a year ago and most of them are of the continuing variety. Increased costs, high wages for labor, the question of mechanized handling, shorter carry of many commodities, elimination of government regulation, are some of the problems cited that are typical of many operations.

California—The most outstanding problem, from our standpoint, is that of increasing costs. One partial answer to this problem is palletization.

Idaho—The outstanding problems here are taxes, freight rates and labor costs. Our fruit and vegetable farmers are largely priced out of the market by these items.

Louisiana—Outstanding problems were "loss of business and how to get it back and keep what you have," threat to the industry from government terminal markets proposals, etc.

Louisiana—I believe the industry's most outstanding problem in 1949 was their lack of business and vacant space. This condition seems to be improving in the last quarter of 1949 and, I believe the first three months of 1950 will show more space occupied throughout the entire industry, as compared to the first three months of 1949.

Massachusetts—High labor rates, multi-stored buildings, a compressed work week, the necessity for better service, and the pressure on rates are all factors necessitating a good deal of thought on the part of each warehouseman on how to improve his operations and facilities to meet the service requirements of the trade in a distribution market.

New York—The most outstanding problem in the industry today is the Government. More and more the privileges of free private enterprise are being usurped by a paternalistic government. There is only one way to meet this problem, and that is for each individual member to do all within his power to sell to his friends, his employees and legislators at all levels, the American idea, the American way of life, the American system of free private enterprise. Nothing will help the refrigerated warehousing industry and industry in general more than this.

New York—One of the important problems before the industry today is what to do about the shorter carry of practically all storage items. This seems to be due to a lack of speculative storage and an increase in short term storage for distribution.

Ohio—The most outstanding industry problems in 1949 were labor and storage and handling rates.

Ohio—In our opinion the outstanding problem in 1949 was decreased volume. That again will be our problem in 1950. There is not much more we can do to save expense.

Oklahoma—We have given very much better service to our customers in addition to reducing our handling costs by using the fork lifts and pallets. I am not particularly anxious to advertise the fact that we have reduced handling costs, because that might be a little bit misleading. The costs are reduced as far as labor is concerned, but we have a large investment in pallets and fork lifts, which of course, must be depreciated at a rather high rate, so when we have had a few years experience, we might find our costs have not been reduced very much. To my mind, the most valuable thing is that our men are happier working with fork lifts and pallets because they don't have to spend so much time in the freezer. In fact the man operating the fork lift is about the only man who goes into the freezer.

Texas—We believe that each individual warehouseman and the refrigeration industry as a whole should strive to eliminate government's interference in business, should seek reduced taxes, and should advocate a national policy of keeping expenses in line with income.

Washington—After the sharp price decline on frozen fruit and vegetables in 1947 some banks refused to recognize the value of a warehouse receipt as collaterial on these items. This was not only a hard blow to packers and warehousemen but also to farmers and local communities. After considerable work a satisfactory settlement was reached in which the banks continue to accept such warehouse receipts. In our opinion this represents one of our industry's outstanding services rendered in 1949.

Building Better Business

FIRST class service to all its patrons is cited as one fundamental activity that will build better business. Research is listed, also an active selling program.

California—For both the immediate and the long range future, a valuable medium for building better business is research.

Idaho—As a basis for building better business we think refrigerated warehousemen could offer better service by doing more advertising and be more cooperative.

Louisiana—To create more business, bigger volume, etc., you have to go out and sell, as always. Keener competition means more effort will be required to sell your space, as always.

Louisiana—I think every refrigerated warehouse man should contribute to the Refrigeration Research Foundation so that all of us could more scientifically preserve the many commodities offered to us by our customers for storage. I cannot speak for the entire United States but all indications point to improved business in the South during the year 1950.

New York—We can't help but be optimistic for 1950. The first three months will probably see a low occupancy, except in a few strategic producing areas. It should then pick up and level off at somewhere between 80 and 85 per cent for the balance of the nine months of the coming year. Poultry and dairy products will probably be heavy, somewhat more so than in 1949. Meat, with the possible exception of pork, should be about the same. Frozen foods should be 10 to 15 per cent ahead of this year. This is based on predicted packs of some of the leading packers.

Ohio—There is only one thing for the refrigerated warehousemen to do in order to create better business and bigger volume and that is to render first class service to all its patrons, and interest themselves particularly in the problems. The writer feels optimistic about business in 1950.

Oklahoma—Relative to the year 1950, I would say it has all the earmarks of being a good year. I feel confident we will carry a considerably higher average occupancy than we carried in the year 1949.

Utah—Government support price on eggs has completely wrecked the egg storage business. The lack of Government support price on vegetables has wrecked our business in so far as quick freezing of vegetables is concerned. The support price on turkeys has increased the storage of turkeys and our suggestion for the good of the industry would be for the Government to get out of the cold storage business, or else take us all over and put us all on pensions or subsidy along with the rest of the inhabitants.

Washington—One thing the warehouseman should be concerned with in 1950 is speeding up release of his customers truck when receiving or delivering goods. By helping the storer cut his costs, you help yourself. Barring crop failures, 1950 should be a busy year for refrigerated warehousemen.

In reviewing factors affecting our business in 1949 and trying to predict the trend for 1950, we find ourselves in about the same frame of mind as we usually are at the start of a New Year; that is, very thankful for the success we have had the past year and deeply concerned with what changes, if any, should be made to assure good patronage in the New Year.

Egg Support Program to Maintain Farm Prices at 37 Cents

THE U. S. Department of Agriculture on December 21 announced a support program for eggs in 1950 which will seek to maintain the national average annual farm price at 37 cents a dozen, approximately 75 per cent of the modernized parity. This compares with a 1949 national average farm price of about 45 cents a dozen, which was approximately 90 per cent of parity under the previous formula.

Commenting on the action taken under the Agricultural Act of 1949, which permits support of egg prices at any level from zero to 90 per cent of parity, as contrasted with the mandatory support at 90 per cent of parity in effect this year, Secretary of Agriculture Charles F. Brannan made the following statement:

"As in the case of potatoes a year ago, I have been extremely reluctant to give my approval to any lowering of the farm support price for eggs. Under the circumstances, however, with no other means than purchases to carry out our commitments to egg producers, there is no alternative.

"Like every egg producer and every consumer of eggs, I am interested first of all in moving maximum quantities of this highly nutritious but perishable commodity into consumption. I see no point in moving large quantities of eggs into Government storage when at a slightly lower price level they would move directly into consumption.

"The cost of things which farmers must buy to carry on their production is almost as high as it was a year ago. Farm income during this period has declined more than 15 per cent, and it will decline still further in the year ahead. The alternative before the Department is to contribute still further to this decline, or to take vast quantities of eggs out of normal consumption channels and put them into storage at considerable cost to the Government.

"It is hoped that support for eggs at a price level approximating 75 per cent of parity will result in a level of consumption more nearly approaching the anticipated level of production, and at the same time provide continuing inducement for farmers to convert abundant supplies of feed grains to such nutritious foods as eggs. Egg production in 1950 is expected to be two or three per cent higher than in 1949 because of a larger laying flock and a higher rate of production per hen. This should assure consumers an adequate supply of eggs. I am hopeful that egg prices paid to farmers for the year as a whole will average above the level of support I have announced."

Demand for eggs for current consumption in 1950 is expected to amount to at least 385 eggs per capita because of the lower retail prices anticipated. This rate of consumption compares with an estimated 374 eggs per capita consumed this year and the record rate of 397 eggs per capita consumed in 1945, a period of severe meat shortage.

A news release from the Production and Marketing Administration, U. S. Dept. of Agriculture points out that the Department has supported farm prices of eggs continuously since May 1948 under mandatory legislation at 90 per cent of parity. In this period the Department has purchased approximately 93 million pounds of dried whole eggs at a commodity cost of about $120,000,000. Of this quantity, 13,700,000 pounds have been turned over to the National School Lunch Program, 8,000,000 pounds have been turned over to foreign countries through the Economic Cooperation Administration and the U. S. Army, and 2,100,000 pounds have been sold under a commercial export program. Remaining in CCC inventories are about 69 million pounds of 1948 and 1949 dried eggs.

Government Buying Fails to Stop Declining Prices of Eggs

STORAGE stocks of shell and frozen eggs have been at record low for recent months but mounting production has caught up with the market. Supported all year by United States' purchase of almost 70 million pounds of dried eggs the market sagged early in December. New purchases added 6.5 million pounds to the government dried egg hoard in a two week period since December 1 but did not halt the price break.

A new plunge in wholesale prices of extra quality eggs early in December brought them to 33 to 34 cents a dozen, down 29 to 30 cents from late September and below the office of price administration levels of 1946. This drop is basically the result of surplus production, the commodity men explained, and the surplus production is the result of price supports.

Overwhelmed by eggs, department of agriculture men say they were acting at the mandate of congress in buying 67,810,142 pounds of dried egg powder so far in 1949 to keep the shell egg price from going down. Secretary of Agriculture Brannan is using the egg situation as a reason for adopting a new scheme of outright subsidies to farmers instead of price props.

The unexpectedly large purchase of more than 3 million pounds of dehydrated eggs the second week in December aided in bringing the decline to a temporary halt, but it resumed the following week and brushed past another government purchase of more than 3.5 million pounds. Each pound, representing 36 eggs, costs the government about $1.25 and it has virtually no market, even in foreign countries, except at half price.

In the Chicago Mercantile exchange futures market, where the powder buying this year eliminated most egg storage and relegated egg volume to a secondary position to onions, the current December delivery sank from 41.25 cents to 36 cents. The January, 1950, contract fell from 37.25 to 34.95 and the September from 39.90 to 38.

Lennartson Appointed Deputy Assistant Administrator of PMA

THE appointment, effective January 3, 1950 of Roy W. Lennartson as deputy assistant administrator of the Production and Marketing Administration, U. S. Dept. of Agriculture, in charge of marketing service and regulatory activities, and of Hermon I. Miller to succeed Mr. Lennartson as an assistant director of the Poultry Branch, has been announced by Ralph S. Trigg, administrator of PMA.

Mr. Lennartson, who has been an assistant director of PMA's Poultry Branch since 1946, will succeed S. R. Newell, who has resigned to become head of USDA's Crop Reporting Board. A native of Minnesota, Mr. Lennartson has served in the U. S. Department of Agriculture since 1936 when he joined the staff of the Farm Credit Administration to engage in work in connection with eggs and poultry marketing. For a three-year period 1942-45 he was a procurement officer for egg and poultry products for the armed forces in the U. S. Quartermaster market system with headquarters in Chicago. After his war service he was called back to the Department to become an assistant director of the Poultry Branch. In this capacity he has been in charge of the price support and research programs.

Mr. Miller has been connected with the Department of Agriculture for sixteen years. Born in Nebraska, he graduated from the University of Nebraska with B.S. and M.A. degrees and took advanced work in agricultural economics and marketing at Cornell University, New York.

NARW Installs Group Insurance Plan for Members

MEMBERS of the National Association of Refrigerated Warehouses may now obtain group life insurance for their employees through the National Association of Refrigerated Warehouses according to an announcement by the Association office. The plan is being underwritten by the State Mutual Life Assurance Co. of Worcester, Mass. It provides $5000 life insurance for participating company officers, $2500 for supervisory employees and $1500 for all other permanent employees. A double indemnity feature providing equal amounts of accidental death and dismemberment insurance is also included. The entire package will cost $1.35 per $1000 per month for the first premium year.

Refrigerated warehouse officials and insurance men met in Wilmington, Delaware, December 19, to complete negotiations for the adoption of the new group insurance plan sponsored by the National Association of Refrigerated Warehouses. Host for the group there was John P. Lemmon, vice-president, Diamond Cold Storage Co., local member of NARW. Signing and witnessing documentation of this step towards employee insurance coverage were, seated left to right, H. Cochran Fisher, C.L.U., agent for the National Association of Refrigerated Warehouses, Washington; Jason Stoughton, State Mutual Life Assurance Company, Baltimore; standing, Mr. Lemmon; and William Dalton, executive vice president, NARW, Washington, D. C.

In order to keep the initial cost of this insurance as low as possible, a maximum entry age of 70 years has been set. In addition, insurance of all officers and supervisory employees will be reduced to $1500 at age 65.

The plan is of the non-contributory, trusteed type and will be administered through a board of five trustees consisting of an insurance counsel, one NARW staff member and three warehousemen. The plan will go into effect as soon as 600 lives have been enrolled.

NARW has been investigating group insurance for nearly a year. This plan was ultimately selected by vote of those NARW members who had expressed interest in group insurance. It represents what they feel best meets their needs and the needs of the industry.

In offering this new association service to its members, NARW points out advantages which the plan offers participating members: (1) It makes possible life insurance at low group rates; (2) it offers group insurance to smaller companies ineligible for group insurance on their own; (3) provides protection for employers, employees and their families; (4) promotes goodwill between employer and employee; (5) increases employee morale and loyalty; (6) no medical examinations are required; (7) it eliminates the need for "hat-passing"; (8) decreases employee turnover; (9) offers an opportunity for employers themselves to provide for the welfare of their employees.

United States Cold Storage Concerns Merge E. M. Dodds New President

THE United States Cold Storage Co. of Kansas City, Mo., a wholly owned subsidiary of the United States Cold Storage Corp., since 1926, and the United States Cold Storage Corp. with headquarters in Chicago have been merged. Eugene M. Dodds of Kansas City was elected president of the ten million dollar corporation. G. D. Allman, Chicago, former president, becomes chairman of the board, —a newly created office. The action was taken at the annual meeting of the board of directors held in Chicago.

Mr. Dodds has been president of the Kansas City Cold Storage Co., and executive vice-president and a director of the Corporation. As an army captain just out of World War I, he was hired as office manager of the Chicago plant when the late H. E. Poronto organized a company to take over the government war storage concern in 1919. Mr. Poronto, later president of the corporation, gave Mr. Dodds his first assignment which was to find a plant manager and he recommended G. D. Allman whom he now succeeds as president. Mr. Dodds moved to Kansas City in 1922 when the Kansas City Cold Storage & Warehouse Co. was established. In 1926 it became the Kansas City Cold Storage Co., a wholly-owned subsidiary of the corporation.

Besides the Kansas City unit, the United States Cold Storage Corp. has two large warehouses in Chicago, owns the United States Warehouse Co. in Detroit and the Tranin Egg Products Co. in Kansas City. The Kansas City company operates branches in Dallas and in Port Lavaca, Texas and the Royal Crown Bottlers in Kansas City.

D. O. Haynes Now Consulting Industrial Engineer

ON December 1, D. O. Haynes established an office at 30 Church St., New York 7 to operate as a consultant in industrial engineering. Lately he had been vice-president of the Merchants Refrigerating Co., with headquarters in that city.

Mr. Haynes is co-author of the present series of articles "Practical Solution to Accurate Refrigeration Storage Costs." Among his earlier articles was the extensive series "Modern Methods of Handling Refrigerated Commodities," ICE AND REFRIGERATION, July 1947-April 1948.

Long engaged in industrial engineering, Mr. Haynes earlier was vice-president and chief engineer of the Haynes Corp. whose services to industry included organization, plant layout and industrial control methods. In addition their work involved special accounting and cost control procedures.

Lectures on efficient materials handling were presented by Mr. Haynes to a number of the training conferences of The Refrigeration Research Foundation and to the National Association of Refrigerated Warehouses. This modern method of industrial cost reduction is one of the features of the services Mr. Haynes is providing for industry.

Cold Storage Holdings—Volume of Eggs Hits Record Low for December

PUBLIC cooler occupancy of 67 per cent was reported on December 1, a drop of 1 point since last month. This decline was less than the average November to December decrease which normally amounts to a 2 point change in cooler occupancy. Only two regions, the West South Central and South Atlantic, reported an increase in cooler occupancy since last month.

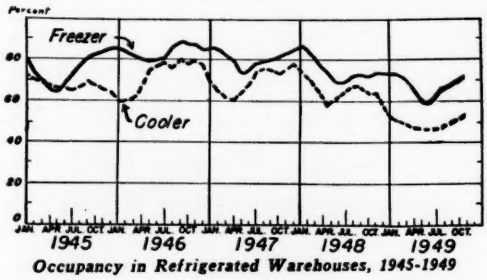
TABLE I—COLD STORAGE HOLDINGS IN PUBLIC, PRIVATE AND SEMI-PRIVATE WAREHOUSES, APPLE HOUSES AND MEAT PACKING PLANTS (000 LBS.)

	Dec. 1, 1949	Nov. 1, 1949	Dec. 1, 1948	Five-year Average
Meat and meat products, lbs.	467,775	370,408	535,056	504,290
Lard and rendered pork fat, lbs.	38,285	38,320	77,021	68,181
Frozen poultry, lbs.	266,084	211,517	171,472	275,697
Creamery butter, lbs.	129,206	144,819	60,214	69,299
American cheese, lbs.	175,821	185,839	140,791	134,100
Other cheese, lbs.	16,464	19,759	19,997	19,130
Shell eggs, cases	236	501	444	869
Frozen eggs, lbs.	72,228	96,382	139,298	162,550
Apples, bu.	33,701	35,224	21,836	29,319
Frozen fruits, lbs.	323,613	342,565	346,941	381,030
Frozen vegetables, lbs.	383,448	387,687	308,829	273,093
Frozen fish, lbs.	161,554	156,077	158,008	147,021

Freezers in public warehouses were 73 per cent filled on December 1, up 3 points from last month. This increase was greater than average, but freezer occupancy was still far below the average December 1 occupancy reported for the 5-year period ended 1948. All regions showed increases in freezer occupancy, but the greatest gains occurred in the New England and West South Central regions.

Public warehouses in key cities were below the national occupancy average, with 64 per cent of the cooler and 71 per cent of the freezers reported filled on December 1. Public warehouses in Minneapolis, however, reported both coolers and freezers were better than 90 per cent filled, while in Detroit only coolers were more than 90 per cent occupied.

Foodstuffs reported in storage on December 1 totaled 4.5 billion pounds, a decrease of 25 million pounds since last month. This decrease was contra-seasonal for this time of year, yet total stocks on hand exceeded average December 1 holdings by about 300 million pounds. More than half of the foodstuffs in storage were cooler-held commodities amounting to 2.9 billion pounds, the bulk of which was apples and pears. Foodstuffs in freezers increased 47 million pounds during November, thereby bringing December 1 holdings to 1.6 billion pounds or slightly less than stocks of a year ago. Frozen fruits, vegetables, frozen eggs, and dairy products were withdrawn from freezer storage in sizable amounts, but this net out-movement was countered by net increases in stocks of poultry, fish, meats, and meat products which accounted for the seasonal increase in freezer weight reported since last month.



Occupancy in Refrigerated Warehouses, 1945-1949

Fresh apples reported on hand December 1 were about 1.5 million bushels less than last month, which means that November 1 holdings of 35 million bushels were the peak for the year. The 34 million bushels in storage on December 1 exceeded last year's stocks by 12 million bushels and were in excess of the average December 1 holdings by 4 million bushels.

Frozen fruits stocks were reduced by 19 million pounds since last month. The net withdrawals were 8 million

TABLE II—PERCENTAGE OF SPACE OCCUPIED BY PUBLIC COLD STORAGE WAREHOUSES (APPLE HOUSES EXCLUDED)

	Net Piling Space (000 cu. ft.)		Dec. 1, 1949 (%)		Nov. 1, 1949 (%)		Dec. 1, 1948 (%)		5-Year Average (%)	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	2,975	5,228	66	85	73	80	49	73	60	83
Middle Atlantic	38,971	31,800	65	75	69	74	60	74	71	86
East North Central	27,801	28,165	70	70	71	67	56	73	70	82
West North Central	9,910	14,195	71	70	73	68	64	72	72	80
South Atlantic	8,937	5,630	61	75	54	72	53	68	68	80
East South Central	3,191	2,648	73	83	77	82	64	84	73	74
West South Central	6,859	6,416	61	52	57	47	58	67	68	81
Mountain	1,699	1,963	63	69	70	70	47	65	66	85
Pacific	16,935	18,489	71	78	67	75	66	70	76	79
United States	117,278	114,534	67	73	68	70	59	72	71	82

Frozen eggs, lbs. 72,228 96,382 139,298 162,550
Apples, bu. 33,701 35,224 21,836 29,319
Frozen fruits, lbs. 323,613 342,565 346,941 381,030
Frozen vegetables, lbs. 383,448 387,687 308,829 273,093
Frozen fish, lbs. 161,554 156,077 158,008 147,021

TABLE III—PERCENTAGE OF SPACE OCCUPIED BY PRIVATE AND SEMI-PRIVATE REFRIGERATED WAREHOUSES AND MEAT PACKING PLANTS (APPLE HOUSES EXCLUDED)

	Private and Semi-Private Warehouses						Meat Packing Establishments					
	Net Piling Space (000 Cu. Ft.)		Space Occupied—Per Cent Dec. 1, 1949		Nov. 1, 1949		Net Piling Space (000 Cu. Ft.)		Space Occupied Dec. 1, 1949		Nov. 1, 1949	
	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer	Cooler	Freezer
New England	172	120	70	80	74	66						
Middle Atlantic	2,071	1,342	68	75	79	81	2,195	390	88	86	87	85
East North Central	3,299	1,611	68	48	76	48	4,316	1,491	86	85	85	80
West North Central	634	2,134	98	91	91	90	14,878	5,704	88	77	89	75
South Atlantic	525	1,708	61	34	66	35	1,456	243	85	98	86	98
East South Central							403	100	85	89	73	84
West South Central	388	81	23	68	29	29	2,525	500	97	100	100	100
Mountain					87	72	421	366	100	100	100	100
Pacific	3,562	3,165	56	75	60	87	2,835	595	94	97	87	96
United States	10,651	10,161	64	67	71	72	29,029	9,389	89	82	89	80

NOTE: Blank spaces indicate that insufficient returns were received.

pounds greater than average for this time of year and exceeded the withdrawals of a year ago by 4 million pounds.

Frozen vegetables amounted to 383 million pounds on December 1—an all-time high for any month since data has been collected. Frozen vegetables in storage were 10 million pounds above average and 75 million pounds greater than stocks of a year ago.

Creamery butter stocks were reduced by 16 million pounds since November 1, leaving 129 million pounds in storage on December 1. The net withdrawals during November were half the average withdrawals and were 7 million pounds less than the net decrease in stocks of a year ago.

Net withdrawals of 14 million pounds of cheese during November brought total stocks on hand down to 196 million pounds. This compares with 164 million pounds reported a year ago, and average December 1 stocks of 155 million pounds.

Poultry stocks showed sharp gains since November 1. During the month there was a net into-storage movement of 55 million pounds, bringing December 1 stocks to 266 million pounds. Although this increase was 30 per cent greater than average, total poultry on hand was 10 million pounds below the average December 1 holdings. The amount of turkeys in storage was second only to the record December 1 holdings of 117 million pounds recorded in 1946.

Shell eggs reached an all-time record low for December 1 with only 236 thousand cases reported on hand. This was more than half a million cases below average. Frozen eggs amounted to 72 million pounds on December 1, the smallest quantity on hand for this time of year since 1937.

Beef in storage on December 1 was below average by 38 million pounds. Stocks on hand the first of this month amounted to 87 million pounds, which compares with average December 1 holdings of 125 million pounds. The net increase since last month of 18 million pounds was about a fifth less than the net accumulations of a year ago Pork holdings, on the other hand, were in excess of the average December 1 stocks, but were below hodlings of a year ago. Frozen pork amounted to 92 million pounds out of the 281 million pounds of total pork reported in storage.

An all-time December high was reached this year as total frozen fishery products in storage totaled 162 million pounds. This compares with average December 1 holdings of 147 million pounds.

Storage Outlook

During the past year average first-of-the-month occupancy in public coolers was 54 per cent, or about equal to the monthly average reported during 1941. New record lows for the months of August and September were recorded in 1949 as well as record increases in occupancy during September and October. The peak occupancy—68 per cent—was recorded last month. From now to early spring there should be a lessening in cooler occupancy as apples and pears move from storage. Based on previous performance, the expected decrease in occupancy during December normally amounts to 5 or 6 percentage points.

Freezer occupancy in public warehouses averaged 66 per cent during 1949. This level of occupancy was only one percentage point more than the average monthly occupancy recorded during the record lows of 1940. As in the case of cooler occupancy, new monthly lows in freezer occupancy were reached in 1949. However, during the last quarter of 1949, significant increases in freezer-held commodities has raised the occupancy level above the previously reported lows. In all likelihood, the 73 per cent occupancy reported this month will be the seasonal high for the year, since January 1 occupancy is either unchanged or 1 point less than the previous month.

Quality Loss Is Heavy As Eggs Are Marketed Says USDA Pamphlet

ONE out of every three eggs has dropped below Grade A in quality by the time farmers in 13 midwestern states sell their eggs to country stores and other first receivers, according to a pamphlet issued by the U. S. Dept. of Agriculture. More than two out of five of these eggs are below Grade A about two days later when they reach the carlot assembler.

Such losses in egg quality occur in the 13 states that usually produce about half of the eggs of this country, according to the publication. These States are Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Michigan, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The publication, entitled "Deterioration of Egg Quality During Marketing," summarizes results of a study of decline in egg quality during the first two steps of the marketing process—from the producer to the country buyer and from him to the carlot assembler. The study was conducted by the agricultural experiment stations of the 13 states and the U. S. Dept. of Agriculture under the Research and Marketing Act of 1946.

Objectives of the study, which covered more than 1,000 buying and assembling plants, were to learn: (1) the quality of eggs at the time producers delivered them, (2) how much this quality declined between the country buyer and the carlot assembler, and (3) which marketing factors caused the quality decline.

Cold Storage Stocks of Frozen Fruits and Vegetables

THE percentage of peach, raspberry, and strawberry stocks in retail packages on November 1, 36 per cent, equalled the record high established last month. There was little change for individual items in this type package from October 1 holdings, with 46 per cent of the peaches, 21 per cent of the raspberries, and 41 per cent of the strawberries reported to be in retail containers. Coverage this month amounted to 70 per cent of the total stocks in storage classified as to container size last year at this time. The percenage of stocks classified each month has ranged from a low of 63 per cent reported in August 1947 to a high of 79 per cent reported in July of last year.

COLD STORAGE STOCKS OF FROZEN FRUITS AND VEGETABLES IN PACKAGES OF ONE POUND OR LESS IN STORAGE NOVEMBER 1 AND OCTOBER 1, 1949 (000 LBS.)

	November 1, 1949		October 1, 1949	
	Lbs.	Pct.	Lbs.	Pct.
Peaches	6,052	46	6,108	47
Raspberries	4,953	21	5,088	20
Strawberries	18,333	41	19,353	41
Asparagus	3,853	75	3,911	74
Beans, lima	26,613	62	19,449	57
Beans, snap	19,734	67	21,104	64
Corn, sweet	11,322	40	9,263	33
Peas, green	38,910	58	41,788	55
Spinach	11,509	81	8,028	79

Sixty per cent of the 182 million pounds of selected frozen vegetables classified as to container size were in retail packages. An out-of-storage movement of larger-sized containers accounted for the increase of 5 points over last month's ratio of retail to larger-sized containers. Increases in the percentages of consumer packages of individual items ranged from 1 point for asparagus to 7 points for corn. Eighty-one per cent of the classified asparagus stocks were in packages of one pound or less, the greatest proportion of consumer packages for any of the selected commodities since data were collected.

Refrigerated Warehousing Industry

Annual Report on Cold Storage Holdings

THE volume of perishable foods stored in refrigerated warehouses each month during 1949 and the two previous years, also the five-year average is shown in the following tables, compiled from monthly government reports. Most commodities showed decreases over last year, exceptions being creamery butter, frozen vegetables and frozen fish. American cheese averaged about the same. For apples, decreases the first seven months were partly offset by sharp increases the last five months. As compared to the five-year average, decreases were reported for frozen poultry, shell eggs and frozen eggs and increases for frozen vegetables and frozen fish, while both decreases and increases tended toward a leveling off condition for other commodities.

TABLE I FROZEN BEEF, PORK, LAMB AND MUTTON (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	783,002	856,710	554,496	659,895
Feb. 1	890,732	996,133	730,651	775,331
Mar. 1	906,547	1,031,014	736,265	814,807
Apr. 1	856,702	967,732	747,682	790,315
May 1	793,755	851,447	715,013	744,899
June 1	681,356	790,039	648,062	713,434
July 1	607,292	778,747	596,675	741,317
Aug. 1	544,429	685,946	548,973	670,615
Sept. 1	447,374	528,169	473,072	550,873
Oct. 1	357,648	394,970	380,715	423,755
Nov. 1	369,632	382,124	389,743	401,052
Dec. 1	467,775	535,056	562,022	504,290

Frozen meat showed a decrease every month over last year, but an increase the first five months and a decrease the last five months over the five-year average.

TABLE II. FROZEN POULTRY (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	161,189	317,463	316,577	297,028
Feb. 1	148,466	293,640	316,792	285,982
Mar. 1	131,414	262,374	283,825	261,536
Apr. 1	108,677	205,745	242,485	215,689
May 1	89,385	153,424	208,256	173,260
June 1	77,571	117,935	187,717	148,113
July 1	74,253	99,507	171,260	134,541
Aug. 1	73,122	91,186	174,267	137,903
Sept. 1	82,825	88,234	183,024	150,655
Oct. 1	130,044	108,368	205,653	168,781
Nov. 1	209,927	154,617	277,870	235,301
Dec. 1	266,084	171,472	317,112	275,697

Frozen poultry showed a decrease the first ten months and an increase the last two months over last year. Compared with the five year average there was a marked decrease each month.

TABLE III. CREAMERY BUTTER (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	33,506	23,672	27,874	64,003
Feb. 1	19,469	13,399	18,224	46,586
Mar. 1	9,162	7,323	9,988	35,079
Apr. 1	6,324	3,482	7,818	27,635
May 1	15,131	4,449	9,194	28,422
June 1	49,200	18,638	17,445	40,595
July 1	101,191	53,073	51,625	77,836
Aug. 1	136,525	83,105	83,286	111,742
Sept. 1	153,339	97,624	88,364	123,075
Oct. 1	153,001	93,850	76,912	114,971
Nov. 1	141,973	83,412	72,125	100,673
Dec. 1	129,206	60,214	46,002	69,209

Creamery butter showed an increase over last year for every month except January. For the five-year average there was a decrease the first five months and an increase the balance of the year.

TABLE IV. AMERICAN CHEESE (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	126,664	128,888	93,873	123,409
Feb. 1	116,427	107,236	87,459	111,531
Mar. 1	111,431	93,570	74,795	102,635
Apr. 1	105,258	90,469	71,757	91,456
May 1	110,281	91,907	88,737	97,494
June 1	114,336	106,712	106,479	114,223
July 1	140,270	140,038	130,005	142,952
Aug. 1	159,919	168,809	151,661	165,549
Sept. 1	183,682	185,324	169,571	175,528
Oct. 1	186,206	182,449	164,651	169,047
Nov. 1	186,491	167,535	151,455	152,511
Dec. 1	175,821	140,791	139,355	134,100

American cheese remained about the same as last year, and the five-year average, fluctuating between decreases and increases.

TABLE V. SHELL EGGS (000 CASES)

	1949	1948	1947	5-year average
Jan. 1	157	196	767	432
Feb. 1	145	269	287	378
Mar. 1	148	374	221	940
Apr. 1	514	1,165	508	2,336
May 1	962	3,091	1,742	4,409
June 1	1,944	4,903	3,452	6,420
July 1	2,316	5,669	4,203	7,440
Aug. 1	1,957	5,525	4,268	6,921
Sept. 1	1,450	4,608	3,807	5,760
Oct. 1	818	3,290	2,804	4,197
Nov. 1	497	1,685	1,818	2,332
Dec. 1	236	444	824	869

Shell eggs continued a downward trend with a marked decrease each month over last year and a still greater decrease over the five-year average.

TABLE VI. FROZEN EGGS (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	105,422	138,192	102,437	127,651
Feb. 1	72,195	122,438	80,800	99,131
Mar. 1	58,781	120,665	73,564	90,245
Apr. 1	77,764	143,253	98,718	131,011
May 1	106,989	195,594	153,876	187,513
June 1	141,729	248,574	202,245	244,096
July 1	166,026	260,748	237,303	275,853
Aug. 1	169,172	257,367	241,573	279,253
Sept. 1	147,148	233,431	234,434	258,752
Oct. 1	121,289	200,968	216,762	232,150
Nov. 1	96,578	169,287	189,596	197,794
Dec. 1	72,228	139,298	164,673	162,550

Frozen eggs showed the same tendency as shell eggs with a marked decrease for each month as compared to both last year and the five-year average.

TABLE VII. FROZEN FRUITS (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	334,345	369,470	470,710	342,279
Feb. 1	318,301	343,539	439,226	319,430
Mar. 1	301,861	316,819	403,664	239,526
Apr. 1	266,428	281,762	367,013	265,194
May 1	237,140	247,895	319,718	231,708
June 1	229,643	250,326	327,700	226,500
July 1	256,264	280,744	332,345	241,944
Aug. 1	335,316	340,894	374,363	313,236
Sept. 1	342,665	371,565	408,119	354,913
Oct. 1	354,286	364,115	402,821	385,428
Nov. 1	346,640	362,423	405,838	392,273
Dec. 1	323,613	346,941	392,077	381,030

Frozen fruits showed a decrease each month over last year but an increase over the five-year average from March to August inclusive.

TABLE VIII. FROZEN VEGETABLES (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	282,371	291,752	333,084	233,753
Feb. 1	262,906	254,853	320,307	212,590
Mar. 1	229,553	226,619	296,588	191,460
Apr. 1	205,618	196,628	276,099	170,080
May 1	190,790	176,118	247,795	150,897
June 1	185,063	160,423	230,827	142,372
July 1	220,194	181,526	251,687	162,880
Aug. 1	239,249	214,076	296,574	202,628
Sept. 1	314,097	266,910	326,603	241,720
Oct. 1	368,717	311,734	353,239	270,018
Nov. 1	386,435	311,968	347,466	280,356
Dec. 1	383,448	308,829	323,991	273,093

Frozen vegetables showed an opposite trend to frozen fruit with an increase each month except January over last year and an increase each month over the five-year average.

TABLE IX. APPLES (000 BUSHELS)

	1949	1948	1947	5-year average
Jan. 1	17,661	29,807	27,344	25,365
Feb. 1	12,962	23,339	19,379	18,907
Mar. 1	9,031	16,567	12,944	12,998
Apr. 1	5,474	10,244	7,593	7,674
May 1	3,324	4,896	3,954	3,625
June 1	1,306	1,855	1,544	1,327
July 1	338	392	329	327*
Aug. 1	168	148	219	159*
Sept. 1	426	214	264	354*
Oct. 1	13,756	4,724	10,435	7,665
Nov. 1	35,566	22,413	34,322	27,712
Dec. 1	33,701	21,836	35,790	29,319

* Four year average.

Apples showed a decrease the first seven months and a sharp increase the balance of the year over both last year and the five-year average.

TABLE X. FROZEN FISH (000 POUNDS)

	1949	1948	1947	5-year average
Jan. 1	152,374	133,844	152,803	127,208
Feb. 1	127,411	112,046	127,381	103,771
Mar. 1	104,481	90,491	97,939	82,061
Apr. 1	83,632	76,743	78,242	66,410
May 1	13,659	16,198	70,202	17,782
June 1	92,060	85,601	79,733	72,049
July 1	112,381	100,537	90,158	87,156
Aug. 1	126,013	127,474	110,611	111,057
Sept. 1	143,430	135,928	132,930	130,703
Oct. 1	148,998	140,161	135,870	136,351
Nov. 1	157,554	148,049	140,070	141,403
Dec. 1	161,554	158,008	142,102	147,021

Frozen fish showed an increase over last year for each month except May and June and an increase for each month except May for the five-year average.

Hygeia Pays Tribute to Erie

THE Hygeia Refrigerating Co., Elmira, N. Y. paid honor to the Erie Railroad when that carrier observed the 100th anniversary of service to the city of Elmira. The refrigeration firm used a large newspaper ad to point out that Hygeia and the Erie have enjoyed a 53 year cooperative partnership in handling, storing and distributing 25,000 carloads of perishable foods.

Cold Storage Holdings in New York

A COMPILATION of statistics on monthly cold storage holdings in New York State covering a period January 1, 1919 to March 1, 1949 has been issued by the Department of Agriculture and Markets of the State of New York. The preparation of cold storage statistics in the state started originally in 1911 by the Department of Health. In 1919 it was taken over by the Department of Agriculture and Markets which has continued the work since that time.

The amount of cold storage space in New York October 1, 1947 is shown in the following table:

Other tables in the report give detailed yearly and monthly statistics for both New York State and New York City on the holdings of apples, pears, fresh fruits, fresh onions, fresh celery, fresh carrots, fresh vegetables (excluding celery, onions and carrots), evaporated apples, dried fruits (excluding apples), canned fruits and vegetables, nuts, frozen apples, frozen blackberries, frozen blueberries, frozen cherries, frozen currants, frozen grapes, frozen peaches, frozen plums and prunes, frozen raspberries, frozen strawberries, frozen Young, Logan, Boysen and similar berries, frozen fruit juices and purees, other frozen fruits, frozen asparagus, frozen lima beans, frozen snap beans, frozen broccoli, frozen Brussels Sprouts, frozen cauliflower, frozen sweet corn, frozen green peas, frozen pumpkin and squash, frozen spinach, other frozen vegetables, cream, creamery butter, condensed and evaporated milk, American Cheddar Cheese, Swiss cheese, cheese other than American or Swiss, shell eggs, frozen eggs, dried eggs, frozen poultry, broilers, fryers, roasters, fowls, turkeys, ducks, miscellaneous and unclassified poultry, frozen fish, smoked, pickled and salted fish, frozen beef, frozen veal, frozen pork, frozen lamb and mutton, beef in cure, dry salt pork in cure and cured, all other pork in cure, cured and smoked, edible offal, lard, rendered pork fat, sausage and sausage room products, canned meats and canned meat products.

TABLE I. COLD STORAGE SPACE IN NEW YORK, OCTOBER 1, 1947 000 CUBIC FEET

Kind of Cold Storage Space	Number of Firms	Gross Space: Freezer Zero F. and below	Gross Space: Above 0 F. through 29 F.	Gross Space: Cooler: Above 29 F. through 50 F.	Gross Space: Total	Net Piling Space: Freezer Zero F. and below	Net Piling Space: Above 0 F. through 29 F.	Net Piling Space: Cooler: Above 29 F. through 50 F.	Net Piling Space: Total
Public general	75	17,742	5,566	31,453	54,761	13,015	4,125	24,269	41,409
Private and semi-private general	60	1,068	2,317	3,353	6,738	803	1,678	2,563	5,044
Meat packing plants	30	211	458	6,720	7,389	177	323	4,539	5,039
Public apple house	19	192	369	6,960	7,521	140	342	5,732	6,214
Private and semi-private apple house	73	4	.....	8,353	8,357	3	.....	7,026	7,029
Total apple house	92	196	369	15,313	15,878	143	342	12,758	13,243
Total cold storage space*	257	19,217	8,710	56,839	84,766	14,138	6,468	44,129	64,735

* A number of firms operate several warehouses each. Not included in this total are a number of small establishments which are covered under the New York State system of licensing and reporting. These, frequently with small volume, are often used by the operator mainly for his own business.

The Ice Industry

National Association of Ice Industries

Executive Offices
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Mount Taylor, Washington, D. C.

Ice Industry Review for 1949 - Plans for Better Business in 1950

THE picture of the ice industry as 1949 draws to a close, as reflected from reports by leading ice producers, is all mixed up as usual, with both gloomy and cheerful findings. There is gloom in the fact that ice sales are down again blamed, to a large extent on adverse weather conditions. But a cheerful note is sounded by increasing sales of processed ice.

Decreased sales created one compensating factor,—there were no ice shortages. Prices and costs continued the trend reported last year,—prices about the same and costs somewhat higher. The help situation showed considerable improvement over last year and the year before.

Activities on the refrigerator and ice appliances front was disappointing, with setbacks in many instances, but highlighted by vigorous selling plans planned for 1950, augmented by incentive plans for salesmen and revival of rental-sales plans.

On the questions of advertising and the outlook for 1950 the viewpoint is almost wholly optimistic. The National Ice advertising program is accepted as an entirely worthwhile all-industry effort. For 1950, the implication is clear that the declining sales of 1949 should provide a stark warning that a better merchandising job will have to be done, embodying a complete program of employee training, local advertising, selling refrigerators and other appliances, and active selling of ice by every means possible.

Ice Sales Show Decrease

SALES volume continued the downward trend from the previous year, caused largely by adverse weather conditions, with mechanical competition a contributing factor. There was one exception, Toronto, Canada, which reported a marked advance in the sale of ice for domestic use. One bright spot is that sales of processed ice in many instances showed increases. As a whole the decreased sales reported pretty well reflect the national average decrease of 12 per cent.

Alabama—Sales for 1949 were off about 20 per cent over last year.

Arizona—Sales for 1949 were down about 18 per cent as compared to last year.

Canada— The past year has shown a marked advance in the sale of ice for domestic use. This increase has been consistent over a period of years and reflects the sale of larger and better ice refrigerators by the dealer and the encouragement generally given to refrigerator buying in the type of service given to the home. Commercial trade remains stationary, but there has been an increase in the sale of sized ice, although the latter has not by any means developed to the same extent as in United States cities. Air conditioning for railway coaches and team-track icing expands in volume, especially as manufactured ice replaces lake ice, of which considerable has been used up to this time.

Colorado—Our loss in total sales for the eleven months was 10.18 per cent but our sized ice sales showed a gain of 6.8 per cent over 1948, and our cube sales showed a gain of 51 per cent over a year ago.

Georgia—Ice sales in Atlanta will be down some 15 per cent from the level of a year ago.

Illinois—Sales of ice in 1949 will show a decrease of from 12 to 20 per cent as compared with 1948.

Indiana—Our sales of ice were down 15 per cent as compared with 1948 and 25 per cent compared with 1947.

Iowa—Our sales during the first six months of 1949 were quite satisfactory but during the months of August and September they were off about 25 per cent and we expect our total to be about 15 per cent less than last year. We believe that this loss of tonnage came largely from cold nights in August and extremely cold weather in September. However, we are not discounting the effect that sales of electric refrigerators have had on our tonnage.

Kansas—Our ice sales were down 18 percentage points in 1949.

Kansas—We are definitely losing the battle for household refrigeration. Our sales of domestic ice are down a third from 1948. In spite of the 34 per cent drop in domestic ice, our total tonnage dropped little more than 5 per cent. Commercial ice held its own. Industrial ice increased enormously. In this category the most important item has been for the processing and shipping of dressed poultry.

Kentucky—Our ice sales for 1949 dropped considerably under 1948. This is due mostly to the fact of recent development and expanding of R.E.A. electric power lines in this section. Electric refrigerators are being installed in rural sections in this vicinity to the extent that ice routes are becoming unprofitable. We have lost several rural routes in 1949 and expect to lose more in 1950.

Kentucky—Our sales of ice in 1949 were adversely affected not only by the weather but also by the fact that all too many customers curbed their usual purchases of ice because of economic reasons. Sales of ice by our individual companies for the first ten months of 1949 as compared with 1948 showed declines of from 1 up to 22 per cent. ompared with 1947, sales ranged from an increase of 3 per cent to a decrease of 26 per cent.

Missouri—Total tonnage for 1949 was off about 16 per cent from 1948, but this would still be considered a satisfactory pre-war year.

Nebraska—The summer of 1949 in Nebraska was very cool, very few days went over 95 degrees and most nights were cool. Therefore, ice sales were off about 20 per cent for the season.

Nebraska—Our sales in 1949 compared with 1948, increased 3 per cent. This increase was due to carloads.

New York—The sale of ice in Central New York during February and March was off, due largely to lay-offs in some of our plants and general uncertainty. The month of September was very bad, so that we ended the season with about a 12 per cent loss in sales over 1948. However, the dollar value is very satisfactory compared with post-war days. Our increase in dollar sales comes from the increased volume of ice sold in prepared sizes and cubes at a higher price than we formerly received for block ice.

North Carolina—We regret very much that we have to report our sales 18½ per cent less this year than in 1948. We believe this was partly due to weather conditions, partly due to less money in circulation and, of course, partly due to mechanical refrigerators.

Ohio—Sales for 1949 were about 30 per cent off 1948.

Oregon—The annual review of our ice business is glum. Our sales are off about 65 per cent, due to elimination of Government Housing Projects, cubers and 25 cents a day "Meterizers."

Pennsylvania—Our sales of ice are approximately 10 per cent less than in 1948, and there was a decrease from the ice year of 1946.

Tennessee—We have just experienced a very good ice season. It was not as good as we had in 1948 or during the year 1947. However, it was better than average over a period of the last ten years. We believe that the main cause of drop in sales was unfavorable weather, too much rain during the months of June, July and August, at a time when we usually have very little rain. We are located in the heart of the TVA region and they have made expansion in the rural electrification and more people have bought mechanical refrigerators during the past year.

Texas—Our sales in 1949 were some 7 per cent below 1948 but still well ahead of previous years.

Utah—Ice sales were off 18 per cent this year; all railroad ice.

Virginia—Our gross sales are off 6.6 per cent as compared with 1948. However, we were able to trim our operating costs on a comparable basis, so that our net result is practically the same as last year. Approximately 50 per cent of the decline in sales was due to conditions since 1949 was a very poor ice year all over the country. The remainder was due to commercial mechanical competition, such as flakers, and ice cube machines and general economic conditions.

Washington—Our ice sales for 1949 were about 12 per cent less than 1948 on all tonnage. Sized ice sales were up 25 per cent over 1948. This increase is due somewhat to the fact that we did not really get organized on a constructive sized ice program in 1948, whereas in 1949, we were equipped to give service to the customer in three sizes of crushed ice. Decrease in sales were largely in the domestic market. Increase in sized ice was also due to the new state law permitting liquor by the drink which went into effect this summer.

Wisconsin—Our ice sales were lower than in 1948 due primarily to weather conditions.

Wisconsin—As the year 1949 begins to fade we can look back through the months and see developments which took place that had a direct affect upon our sales. Our ice sales for the year 1949 were off approximately fifteen per cent. This drop was due largely to the increased amount of electric refrigerators installed, the ice cube making machines, and a decrease in the amount of ice sold to dealers.

No Ice Shortages

REVERSING the trend of two and three years ago, no ice shortages were reported, partly due to decreased sales and partly due to increased capacities. For 1950 it is not expected that this will be a problem.

Alabama—We did not have any ice shortages during 1949.

Arizona—No ice shortage was experienced during 1949.

Indiana—No shortage of ice in 1949.

Iowa—We had no ice shortage in 1949, nor do we expect any in 1950.

Kansas—We had no shortage of ice.

Kentucky—No ice shortage existed in this section in 1949.

Kentucky—Because of decreased sales we had more than enough ice to meet all demands.

Missouri—We did not have any shortage of ice this year and do not expect to have in the future as we have adequate storage facilities.

Pennsylvania—During this year, there was no shortage of ice in this district.

Virginia—We had ample production to take care of our immediate area and, as a matter of fact, one of our plants did not operate full capacity, only during the peak season.

Wisconsin—We did have an adequate supply of ice but might have run into difficulty had our one "hot spell" (from June 24 until July 6) continued.

Increased Prices and Costs

NO INCREASED prices but higher costs were the general rule during 1949 and this inevitably resulted in drops in net earnings, in spite of valiant efforts to develop more efficient operations. One valuable aid in this respect to which ice men are looking is the establishment of semi-automatic plants which require less help. For 1950 there is little prospect of any appreciable increase in prices.

Alabama—We increased prices during the year $2.00 per ton retail, and costs were higher.

Arizona—No, we did not increase our prices, but costs were much higher.

Canada—The price of ice to householders is slightly more than last year but less than 1926. It is evident that a moderate price, standard quality and service and consistent promotion accounts for the steady expansion of domestic trade. A new 80 ton plant is now in course of erection to take care of additional tonnage in Toronto.

Colorado—We did not increase prices over a year ago, but our selling and delivery costs increased about 17 per cent. This was partly due to an increase in wages over what we paid a year ago.

Georgia—We made no price changes during the currept year and consequently had a sharp drop in net earnings although by close supervision we were able to confine our increase in unit cost per ton to five per cent of what it was a year ago.

Illinois—There was no general increase in prices although there may have been some readjustments upward on processed ice that was out of line. Costs, in most cases can not readily be adjusted to decrease in income.

Iowa—Although we were able to reduce our costs somewhat, we were not, because of the large fixed charges inherent in the business, able to reduce them in proportion to our loss in income. One of the factors which we expect to help us in reducing costs during the coming year is the fact that we can employ more competent people. Another factor which we expect to help is the fact that we have converted our plant to semi-automatic operation and are therefore able to operate with less help.

Kentucky—We did not increase the price of ice this year nor do we expect to do so in 1950. Costs were somewhat higher in 1949 in comparison with income but this was due to a drop in sales. Some ice in storage had to be thrown away.

Kentucky—We expect ice prices to remain unchanged throughout 1950. Costs continued to increase so that with reduced sales the spread between costs and income was much less than in previous years.

Missouri—Prices for ice remained the same as in 1948 and our costs were not out of line compared to the last few years.

Nebraska—There was no price increase in 1949 but costs were up about 2 per cent due to higher wages.

New York—There has been no increase in our price schedule. While our wages and costs have increased, we have been able to offset this increase by improved methods of operating and better labor conditions.

North Carolina—We did not increase our price and with the decrease in tonnage our costs were, of course, out of line with our income as compared to previous years.

Ohio—There was no price increase in 1949. Because of less volume, cost was considerably higher. It costs over $1.00 more per ton to manufacture than it did in 1938. Although we decreased our expenses in 1949, we could not decrease enough in percentage to equal the decline in volume.

Pennsylvania—We did not increase the price of ice, much to our regret. Our operating costs increased due to demand of delivery and factory men through their union representatives for increased wages.

Tennessee—We had a very small increase in the retail price of ice last year. However, we are of the opinion that this did not cause a reduction in the sale of ice to any great extent. We have experienced continued increased cost of practically all of the supplies we have to buy.

Texas—We did not increase prices during the year. Our costs compared favorably with 1948 but were comparatively above previous years.

Washington—Prices on all types of ice remained the same during 1949. Operating costs are up slightly, due mostly to increased wages of routemen. Overall operating costs are still not in line with income compared to prewar years.

Virginia—We had no price increase since January, 1948. At that time we made a slight increase in certain types of consumer rates, but not a general increase to all customers. I believe that the public is now absorbing about all the price structure that the market will stand. Our price structure is a shade higher than the extreme southern states where they enjoy a longer season, but less than the northern states, with a shorter season.

Wisconsin—We did not increase prices during the year, and it is our intention to carry on at the same levels at present, unless there are some major changes in our costs. Our costs as compared to our income were somewhat higher than in previous years.

The Help Situation

GENERALLY speaking, the help situation was no problem, most concerns reporting that they were able to employ competent help. For 1950 the outlook in this respect is good.

Alabama—We were able to employ competent help and the outlook in 1950 in this connection is very favorable.

Arizona—We had adequate help and the outlook for 1950 is good.

Colorado—Our labor situation was much better than a year ago, and from present indications it looks like it may be the same in 1950.

Georgia—We were able to employ the necessary help and find that we can be a little more selective so that, as a result, the overall quality of our personnel has improved.

Illinois—Labor is becoming a little more plentiful but the quality is not the best. Barring a deep recession, we think the situation will not change perceptibly in 1950.

Indiana—We were able to employ adequate help. Employment outlook for 1950 is satisfactory.

Kansas—We were able to employ adequate help and the outlook for 1950 is good.

Kentucky—We had adequate manpower in 1949 and may need even fewer men in 1950 as we plan to discontinue manufacture at one small plant and replace the sales platform with a vending station. We feel the need of fewer, but better trained men.

Kentucky—Sufficient help was available at all times and we do not anticipate any difficulty in securing the necessary manpower during 1950. The interest which our employees took in the business showed an improvement over previous years. We expect to use the merit point incentive plan for remunerating our employees. Coupled with this we will have three quarterly sales contests plus a seasonal contest running from January 1 to September 30. A total of seventeen prizes will be offered the winners of these contests including two all-expense trips to New Orleans, other shorter trips and several hundred dollars in cash.

Missouri—Our employee situation is adequate, but has not yet returned to the pre-war level.

Nebraska—We had adequate help and do not expect any shortage in 1950.

Nebraska—We had considerable difficulty getting adequate help and most of the help we got weren't dependable. Here today, gone tomorrow without notice.

Ohio—Adequate help was available. No new help was needed. That in our opinion will prevail in 1950.

Oregon—We had plenty of competent help and expect this condition to continue in 1950.

Pennsylvania—We had plenty of help in 1949 and looks like a greater demand for jobs in 1950.

Texas—We were able to employ adequate help and in our opinion even though we had much more turnover in 1949, the help in general was better.

Washington—Employee situation is better at present than for some time, and we anticipate no troubles in 1950.

Utah—We had plenty of help and do not expect this to be a problem in 1950.

Virginia—The manpower situation was fairly stable although we were not able to employ as high a type of personnel as we would like. The outlook for 1950, with reference to manpower, looks as though it will run about the same as this year.

Wisconsin—We did not have a manpower shortage. For the future, with wages continuing to climb, we intend to put more stress on selection and performance standards of our men.

Processed Ice Sales Increase

MOST companies report increased sales of processed ice, although a heavy toll of this business is being taken by the individual ice making devices. Continued increase is expected for 1950.

Alabama—The sales of sized and crushed ice at our plant was about the same as previous years, being 5 per cent of our total sales. Expect to sell slightly more in 1950.

Georgia—Our sales of prepared ice now runs 5 per cent of sales against 2½ per cent a year ago and we expect the proportion to increase further.

Illinois—Increase in sales was noted in crushed and sized ice, the percentage is growing each year.

Indiana—We sold crushed and cubed ice. About 15 per cent of total sales were in this form. We expect to increase sales of prepared ice in 1950.

Kansas—From zero two years ago, prepared ice in 1949 accounted for nearly 14 per cent of our total tonnage, considerably more than 14 per cent of our dollar sales.

Kansas—We sold sized ice and the sales were greater than in 1948. We expect to sell even more in 1950.

Kentucky—Our sales of crushed and sized ice is growing slowly but steadily and we expect to sell more each year.

Kentucky—Sales of sized ice continued to increase. Such sales ran from 10 per cent up to as high as 25 per cent of total ice sales. We have every reason to believe that the sales of sized ice will continue to increase from year to year.

Missouri—We sell sized ice and had an increase in sales this past year as a result of many grocers in the city starting to use ice for their vegetables. We do not keep separate figures for our crushed ice but an estimate would be 20 percent of total tonnage. We expect larger sized ice sales in 1950.

Nebraska—Our sized ice sales showed a smaller decrease than block ice.

Nebraska—Crushed ice sales were the same as 1948 but cubed ice sales dropped 40 per cent, due to customers installing their own cubing machines.

New York—The sale of block ice is declining, while the sale of sized ice and cubes is increasing, in spite of the installation of ice cube makers in our larger stops. Our leading markets are using a properly screened ice (free from snow) that passes through a ¾ in. screen for their meat, poultry and fish display cases.

North Carolina—We have been selling sized ice for the past several years. Our tonnage has steadily increased every year with a slight increase this year over last, and we anticipate still a better year in 1950.

Ohio—Our decline was in block ice. We sold more crushed ice in 1949 than in the previous year.

Oregon—About 30 per cent of our business is sized ice. But a heavy toll of this business is being taken by the so-called "automatic ice makers."

Pennsylvania—We sell sized, crushed and cubed ice and our sales of processed ice show a decrease due to mechanical competition in this field. Our sales in this branch of the business are 20 per cent of our total tonnage sales and we are hoping to increase this in 1950.

Texas—We did sell and have sold sized and crushed ice for a number of years with the happy experience of having the sales of processed ice continue to increase each year.

Utah—We sold about 24 per cent more crushed and sized ice than last year and expect to increase that percentage in 1950.

Virginia—Our sized and crushed ice sales showed approximately a 16 per cent increase over 1948. This type of business seems to be constantly growing. However, this represents only about 11 per cent of our tonnage at the present time.

Washington—Sized ice sales were up 25 per cent over 1948. We expect to sell still more in 1950.

Wisconsin—We sell crushed ice and these sales have increased; this trend is expected to continue.

Wisconsin—We do sell sized ice in both the cube and crushed type. Both of these sales were somewhat below that of the year previous. Of our total sales approximately 15 per cent was that of sized ice.

Refrigerator and Appliance Sales

THE sales of refrigerators and other ice using appliances showed a distressing decrease. A large number of companies said their sales were far from satisfactory and indicated revamping of sales plans for 1950. One exception was noted in which such sales were characterized as the one bright spot in the company's business during 1949, (resulting from a vigorous and sustained sales program) and for 1950 they have plans made for the greatest refrigerator merchandising campaign in their history. Others report satisfactory revival of rental-sales plans.

Alabama—Yes, we sold ice refrigerators and other ice-using equipment but the sales were not satisfactory in 1949. Selling plans in this connection will be limited in 1950.

Arizona—We sold refrigerators and other ice-using appliances but didn't find the sales very satisfactory in 1949. However, in 1950 we plan to use a rental plan.

Canada—As compared with the previous year, dealer sales of ice refrigerators were down one-third, but this drop was in large part due to the fact that appliance, hardware and departmental stores have been much more active in this line. The 1950 models are more streamlined in design with some interior improvements in the shelving and drain pipe, aimed at more convenient storing of foods and periodic cleaning. It is evident there has been a strong building-up of prestige for the home refrigerator and that the competitor's one-time slogan "pride of possession" no longer has the same force. The modern ice refrigerator takes a worthy place in any kitchen.

Colorado—Refrigerator sales were not as good as they should have been. Part of this was due to threat of a steel strike, this being to a great extent a steel town.

Georgia—Our refrigerator sales are far from satisfactory in that they are 40 per cent less than they were a year ago. Our plans for next year have not been fully developed, but we realize that if we are to continue in the ice business our sales of ice refrigerators and other appliances must be triple what they were this year to get up to what we would consider a satisfactory sales level for this particular branch.

Illinois—No one is satisfied with the sales of ice-using appliances. Few companies are making any organized effort to merchandise either ice or appliances. That is the weak spot in the industry. Unless a determined effort to merchandise is planned and executed, 1950 will be a repetition of 1949 or worse.

Indiana—We are selling ice refrigerators, beverage chests, water coolers, etc. Volume of sales was not satisfactory. In our 1950 program, we expect to (a) use National Ice Merchandising Training Program, (b) use Indiana University Distributive Education Training Program, (c) use Ice Cooling Appliance premium plan, (d) hold contests for employees.

Iowa—We have made every effort to sell ice refrigerators during the past year, spending considerable sums in sales promotion and advertising. The results were disappointing as we did not sell the number of ice refrigerators and other ice using appliances which our experience before the war would indicate we should have sold. It is our intention to continue the promotion of ice using appliances in 1950, though probably not in the same manner as we did in 1949.

Kansas—Our sales of home ice refrigerators have practically ceased.

Kansas—We are selling ice refrigerators and ice-using appliances and have had pretty fair success.

Kentucky—We sell ice-using appliances but sales have been low for the same reason that ice sales have dropped. We had increased sales in pressure water coolers. We plan to continue the sales of ice-using appliances. We put most appliances out on the rent-or-sale basis. Small monthly payments are required and in case the user wishes to purchase the unit the payments already made are applied to the purchase.

Kentucky—Our sales of refrigerators and ice-using equipment were the one bright spot in our business during 1949 with total sales approaching 1,200 new units. For 1950 we have plans already made for the greatest refrigerator merchandising campaign in our history.

Missouri—We sell ice refrigerators and appliances but did not have satisfactory sales in 1949. We recently started a rental plan for refrigerators and have had very good success in a short time. We plan to push the rental plan this spring as well as renew our efforts to increase sales of refrigerators and appliances.

New York—We haven't sold many domestic ice refrigerators. we did adopt a monthly rental plan which resulted in a few sales and seems to be quite satisfactory. We hope to see someone produce an attractive storage chest which we can sell the owners of mechanical refrigeration for the storage of a half bushel of ice cubes and a bushel of sized ice.

North Carolina—We are selling domestic and commercial refrigerators as well as ice-using equipment of all kinds. As to whether our sales were satisfactory, our answer is "yes", but we would add that we should have done better. Our sales for 1949 were just a little over our sales for 1948. For the coming year we propose to furnish a new air conditioned five cubic foot ice refrigerator, plus 500 lbs. of ice for 16⅔ cents per day for a period of four years, at the end of which time the refrigerator will become the property of the customer.

Pennsylvania—We did not sell very many refrigerators or ice appliances in 1949 and will probably not increase our sales materially in 1950.

Tennessee—We sold a number of ice refrigerators, ice bottle coolers and ice drinking fountains during the year. However, the sales did not come up to our expectations.

Texas—We are selling and have sold refrigerators and ice-using appliances and had a nice increase in our sales this year. This, in my opinion, was due to being able to employ more competent help in our sales department.

Virginia—The sale of ice refrigerators and other ice using appliances showed an alarming decrease, being approximately 46 per cent. The sale of these units is meeting with considerable resistance and I believe that a great part of this is due to the high costs of this merchandise. We have constantly reduced our spread on this type of merchandise in our attempt to offset the decline. We expect to continue to vigorously promote the sale of all types of ice appliances as we believe this to be one factor that should not be overlooked in our attempt to retain the tonnage we now enjoy.

Washington—We sell very few domestic refrigerators, though we do have in stock new 75 lb. and 100 lb. models. We have had some sales in used 100 lb. models. No special plans for 1950 in merchandising either domestic or commercial appliances.

Wisconsin—Our ice refrigerator and appliance sales were not satisfactory this year. We intend to stress the "California" rental plan this year.

Wisconsin—Our sales of ice-using appliances was very small this year and we surely expect to increase this type of business for the year 1950. We definitely want more ice-using equipment in operation.

Advertising

WHOLE-hearted acceptance of the National Ice Association's advertising program appears to be the general rule from both large and small companies. Among the suggestions offered are that there should be more "point of sale" material; and more local advertising pointed to grocers and hotels and other users of commercial ice.

Alabama—Yes, we plan to use material from the National Association of Ice Industries for our local advertising and merchandising activities. We have no suggestions for adding to or improving this material.

Arizona—We plan to use the National Association material for local advertising and merchandising activities. We have no suggestions for improvement.

Georgia—We use all the advertising material from the National Association developed for local use in our operations. I believe that the plan of the Personnel and Marketing Department in setting up merchandising forums in the various states will do much to stimulate a better merchandising activity on the part of our own organization and others who may attend the forums since through this medium the advertising and merchandising ideas of the National Association can be brought closer to the average ice man and proven sales plans and ideas better disseminated to the members of the ice industry.

Indiana—We plan to use National Association advertising materials. Have no suggestions for improving this material. It is splendid.

Kansas—We plan to use all material available from the National as well as anywhere else that we can get and use.

Kentucky—We plan to use some materials from the National Association in our local advertising although we feel that some of the material is not profitable in small operations and small towns. In our opinion the National Association along with N.I.P.R. are doing as well as could be expected.

Kentucky—Full use will be made of the material offered by the National Association of Ice Industries for local advertising and merchandising activities.

Missouri—We make use of the National Association information for advertising and merchandising and think that the organization does a fine job.

Nebraska—Nebraska ice companies are not supporting the National Ice advertising program but why is more than I can explain as the National program is certainly a splendid one and is as good for small companies as for large. It is a program which is certainly making the public realize the tremendous job ice is doing for all of us.

New York—We expect to increase our local advertising of ice cubes and will try to develop more retail outlets in neighborhood stores, so as to make cubes easily available in a 7 lb. bag. We hope to see our National Association produce "point of sale" advertising material. We can use it! We would also like to see our National Association give greater emphasis to cubes and sized ice and do a little research as to where and how sized ice is being used.

North Carolina—We are planning to use most of the material furnished by the National Association of Ice Industries in helping set up our advertising program and for the training of our men. We have found this material very helpful in the past, particularly the employees training course.

Pennsylvania—We have used all forms of advertising—radio, newspaper, local publications, and have shown the picture "Naturally Yours" to various groups in the Pittsburgh district. I believe that the advertising material shown at the National convention is an improvement and should help our sales of processed ice during 1950.

Tennessee—We use the newspapers, radio, motion picture and truck banners to tie-in with the National advertising program.

Texas—We have used all sales promotional material and advertising from our National Association and will continue to do so.

Utah—We do not plan to use material from the National Ice Association in advertising.

Virginia—I think that the industry should support the National Ice advertising program to the limit as well as local promotional features to the extent of their ability. Keeping the public ice-minded and giving complete service will do as much good to promote the sale of new tonnage as anything that I know of.

Washington—We have secured some material from the National Association of Ice Industries for driver training course and have used it. We feel that there should be more of a local advertising tie-up with the National Association, with more attention to grocers, hotels, etc., than to domestic users.

Wisconsin—We plan to use material from the National Association wherever feasible.

The Outlook for 1950

AGAINST a background of decreased sales of ice and unsatisfactory merchandising of ice using appliances, there is a diversity of opinion as to what should be done to improve conditions in 1950. One comment is that declining sales should jar many concerns into the stark realization that they must do better than they are now doing if they expect to retain their ice business at a profitable level. Other suggestions are more training of personnel, rental or contract plan on refrigerators, more advertising, selling ice to mechanical owners, use of vending stations, more promotion of ice for vegetables.

Alabama—We think the outstanding thing the ice industry should do in 1950 is to train personnel.

Arizona—The ice industry should try to rent commercial and retail appliances.

Colorado—I think that we are going to have to get into some sort of a rental or contract plan to compete with the mechanical people, who are putting out new mechanicals without any down payment.

Georgia—The Centennial Celebration of the ice business should serve to bring the average member of the industry to the realization that there has also been 100 years of changes and that in more recent years, many substitutes have been developed which either do away with the use of ice entirely, or offer an opportunity for it to be made on a customers' premises. It is my observation that few people are doing as thorough a job of selling ice and ice using equipment as they should be doing. I hope the decrease in earnings during the current year will jar many companies into the stark realization that they must do better than they are now doing if they are to retain their ice business at a profitable level.

Illinois—Among the more important things the ice industry should do in 1950 to bring about more sales or better business is, —alert management, trained personnel, improved service, a well organized merchandising department with a responsible man in charge, stock and display equipment, survey the market to discover type of equipment needed, type of service desired, make ice readily available in such form and such location and time as desired and advertise.

Iowa—I believe that 1950 will be a crucial year in the ice industry and that the effects of every company's activity or lack of activity will affect every other company. I believe that the outstanding things which the industry should do in 1950 is to promote ice sales through the use of material furnished by the National Association of Ice Industries, through advertising and through its driver salesmen.

Kansas—The outstanding thing for the ice industry to do is to get off of their office chairs and try to merchandise their products through as many new outlets as are possible. It can be done and is being done in many sections.

Kansas—We may have hit the bottom of the slide. A good many new families came into being the past several years, and ice was used by necessity, not by choice. The opportunity to change came in 1948-49. The residuum of ice users will be more stable. We are going after the "occasional" ice in 1950 as we have never done before. The sum total can be very great. To attract this sort of business requires: (1) high quality of ice, (2) cleanly processed; (3) convenient availability; and (4) PROMOTION. The National Association is leading the way, and we are panting to keep up with its great program.

Kentucky—The one most outstanding thing which the ice industry should do in 1950 is to unitedly close its ranks so as to present a solid front in not just merely meeting competition but even more important in advertising its services. It must make its products, i.e. block, sized and cubed ice, more easily available and go all-out for the market for ice which exists in the millions of homes which have mechanical refrigeration but would prefer manufactured ice for table and beverage use if such were readily available day or night in every city and town.

New York—We like the future outlook for our business as well as any. It is less competitive and new uses for ice are developing. In sized ice and cubes, we have something to advertise and sell.

North Carolina—It is our opinion that the things we must do in 1950 to promote more sales of ice and ice-using equipment are to put salesmen on our routes instead of men just to make deliveries who will gain new customers instead of just calling on the customers that we already have, also it will be necessary for more ice companies to realize that if we are to increase our business or hold what we already have, it is going to be necessary that we all put forth every effort to sell equipment for the use of ice.

Oregon—The ice industry should keep up its vegetable icing program.

Pennsylvania—We look forward to new sales through the automatic vending stations. We have now installed five "Serve Yourself" stations which we believe are located in areas where there are a great number of mechanical installations but believe that with the 24 hour ice service, we can acquire the business which has not been taken care of in supplemental ice. It is my opinion that the vending stations should bring back to the ice industry a lot of customers we have lost in previous years.

Tennessee—We are of the opinion that the ice industry should do well in 1950 if ice men will do as good a merchandising job as they do on manufacturing. More than ever before, ice will have to be merchandised for the best progress in the business.

Texas—It is my personal opinion that if the ice industry will in 1950 use to every advantage that which we have to use, our business will continue to grow and be a profitable one. The 7 per cent loss suffered in our immediate area was due entirely to weather conditions and I am thoroughly convinced that if we had enjoyed the same weather in 1949 as we did in 1948, we would have been able to report an increase in our overall sales.

Washington—The ice industry as a whole must modernize; not only designs of appliances, trucks, uniforms, venders, but methods of merchandising. The ice industry as a whole are years behind in their thinking and methods of doing business. The automatic venders are doing a good job for us. The season locally was long and considered good ice weather. The season ahead—1950—will be another of careful planning and renewed effort if the industry is to continue. We are optimistic and feel the job can be done.

Wisconsin—Probably the largest single factor which we believe the ice industry can do to obtain more sales is an aggressive campaign in the training of all personnel connected with ice sales. We have gone along for years being satisfied with training routemen and personnel with material that was used many years ago. However this is 1950 and training should be brought up to this date. Things we have learned in the ice industry years ago are sound naturally, and we have benefitted by them but these same ideas should be studied and then presented in a modern up-to-date method. I am confident as reporting for one ice company that we will be proud of our ice sales for 1950.

Morgan Fined—Violated Sherman Act

FOLLOWING conviction on charges of violating the Sherman Anti-Trust law, as announced in the December issue of ICE AND REFRIGERATION, S. R. Morgan of Shreveport, La. was fined $500 in federal district court November 28. Judge Ben C. Dawkins imposed the fine after lecturing Morgan. He suspended the imposition of sentence on three ice firms, charged jointly with Morgan on charges of conspiring to restrain interstate trade in the manufacture, sale and distribution of ice.

Judge Dawkins warned Morgan that because of his conviction in the anti-trust suit, the United States attorney or the federal court probation officer may, if they see fit, recommend that a five-year probation term he is now serving be revoked.

Morgan was sentenced in 1946 to serve a short prison sentence on one count of an OPA injunction in connection with the operation of an ice plant at Oakdale. After serving the sentence he was placed on supervised probation for five years. He has served approximately three and one-half years of the probation sentence. Revocation of the probation sentence would make Morgan liable for sentencing on approximately 50 other counts of the OPA violation.

Ice Company Tests Vegetable Icing in Chain Store

A TEST run in a Kroger grocery in connection with vegetable icing is being conducted in Princeton, Ind., by the Henneberger Ice & Storage Co. Working with district Kroger officials, F. J. Henneberger has installed two six foot Trusty cases. The test will cover a thirty day period, during which time complete records will be kept on sales volume.

The National Association of Ice Industries has cooperated in this test by sending Andy Andrich of the Public Relations Department to Princeton in order that the latest in produce merchandising methods might be utilized. Also, Eric Oesterle of Purdue University is lending his experience to the test run. It is expected that Mr. Oesterle will bring his produce trailer to Princeton where he will conduct his produce training school for grocery owners and produce department managers.

Mr. Henneberger has left no stones upturned in gaining publicity for this test run. By utilizing civic clubs programs and local advertising, plus editorial space in local newspapers, he has been most successful in making Princeton people conscious of the important work being done at the Kroger store. If this program is successful in convincing Kroger executives that the ice display is capable of increasing sales volume it is expected that they will recommend the use of ice display cases in other stores within their realm of influence.

Ice Shown at Grower's Convention

STARTING with the world's largest salad bowl filled with fresh tossed vegetables which highlighted the annual banquet, the 41st annual convention of the Vegetable Growers Association of America had as its theme "It's the green stuff that counts." On the banquet speakers table were giant initials "V G A", each cut from a 300 lb. block of ice, and the ice really made the banquet table sparkle. A representative of the Polar Ice & Fuel Co. of Indianapolis gave a demonstration showing how to make flowers and other attractive objects out of sliced and whole vegetables.

National Ice Marketing Institute Graduates Third Class

EIGHTEEN graduates of the National Ice Marketing Institute attended an informal get-together luncheon at the Commodore Hotel at the recent National Ice Convention in New York.

N.I.M.I. Superintendent Tom Douglas greeted graduates from eight classes of the Institute. Attending the luncheon were: Cooper Andres, Oklahoma City; Charles Capito, Charleston, West Va.; Hartwell Cappell, Greenville, S. C.; Roger Catts, Indianapolis, Ind.; Jim Crouch, Griffin, Ga.; Harold Dailey, New Castle, Ind.; Ched Dearing, Somerville, Mass.; Bill Esphorst, St. Louis, Mo.; Dick Fischer, Akron, Ohio; Ike Greenberg, Toronto, Canada; P. J. Mastin, Syracuse, N. Y.; Karl Pflanz, Belleville, Ill.; Don Rose, Evansville, Ind.; G. S. Sherrod, Greensboro, N. C.; Elman Stausebach, Wilmington, Del.; Fred Waible, Evansville, Ind.; Bob Walton, Indianapolis, and Fred Smith, Trenton, N. J.

The third class in the current Institute series was graduated at a final dinner at the Hotel Sheraton in Washington on Friday, December 9.

Daniel A. Prager, Director of the Personnel Training and Marketing Department of the National Association presented the certificates. Mr. Prager congratulated the graduates on their performance and complimented the companies they represent on their progressiveness.

Attending the dinner were: Mr. Prager; C. P. Austin, Director of the Research and Engineering Department; F. X. Timmons, Director of Advertising and Publicity; and Tom Douglas, Superintendent of the Institute, all of the National Association of Ice Industries; Dr. Charles E. Bish and Edwin L. Stevens, both of George Washington University and guest lecturers at the Institute; and the new graduates—Richard W. Chadima, Hubbard Ice & Fuel Co., Cedar Rapids, Iowa; H. T. Hildebrand, City Ice Service, Inc., Shreveport, La.; Louis R. Lafferty, City Products Corp., Dayton, Ohio; James F. Merrick, Middletown Ice & Coal Co., Middletown, Ohio; James Morris, Birmingham Ice & Cold Storage Co., Birmingham, Ala.; and Oscar W. Nester, Polar Ice & Fuel Co., Indianapolis, Ind. Class President Oscar W. Nester presided.

Retired Ice Producer Honored

FRANK O. RETTIG, retired ice manufacturer, recently celebrated his 90th anniversary at his home in Highland Park, Chattanooga, Tenn. He was visited by a delegation from the Chattanooga Half-Century Club and was presented with a hamper of fruit.

Mr. Rettig is one of Chattanooga's pioneer ice manufacturers. He formerly owned and operated the Big Spring Ice Company and later formed a partnership with L. C. Riggs, this partnership consolidating the Chattanooga Ice & Bottling Company, the Lookout Ice Company and the Big Spring Ice Company, the consolidated firm being known as the Chattanooga Ice & Coal Co. About 1910 this company was merged with the Atlantic Ice & Coal Co. Mr. Rettig then acquired several creamery companies and in 1926 disposed of them and retired.

American Ice Dividends

THE American Ice Company declared a dividend of 60 cents and an extra dividend of 10 cents on the common stock, payable January 4 to stock of record December 9. The company paid 60 cents on the common stock January 4, 1949.

Reports From Unit Ice Associations

Illinois Association of Ice Industries — 43rd Annual Meeting

ADDITIONAL markets for ice are available the Illinois Association of Ice Industries was told at its 43rd annual meeting and the members were urged to get to work on the development. The convention was held at Peoria on December 14-16 with headquarters in the Jefferson Hotel.

President Robert Muckerman opened the meeting with his report of the association activity during the past year. William Wright presented the financial report which was accepted by the membership and then gave a detailed and illuminating account of the recent National convention.

Progress in the American poultry industry has reached the point where a large market for ice has been created in the processing and handling of poultry, according to W. G. Glennon, Swift & Co., Chicago. He reviewed the large scale production of chickens on a specialized basis for food use. Earlier this was a seasonal by-product market in the production of eggs but lately poultry has been raised for the fresh market throughout the year and a fifty-two week demand has been created.

Mr. Glennon showed a slide film depicting processing and marketing of this poultry. A large volume of ice is used in packing, distribution and retail sale. Swift & Company has specialized in poultry promotion and has demonstrated that display of the birds in a generous bed of cracked ice contributes greatly to volume sales. In addition proper icing prevents shrinkage and loss of weight in the retail market. He estimated that one million tons of ice will be used next year in this development and a larger volume will be consumed as the program expands. Ice men were urged to join in the promotion by working closely with poultry retailers, and the promotional aids produced by his company were offered by Mr. Glennon to assist in the development.

The demand for ice is not reducing but rather is increasing all the time. C. F. Austin, Director of Research, National Association of Ice Industries, pointed out. He said however more people want to satisfy the ice demand and this results in greater competition for commercial ice plants. Numerous ways in which the ice industry could promote consumption and share in the increased market were reviewed by Mr. Austin. A beginning has been made in produce icing for retail stores but much volume remains to be developed. The field application of ice to locally grown produce presents a large area for ice merchandising in many sections of the country.

Mr. Austin suggested that ice men go to their state colleges and push the use of federal funds for investigations in this and other desirable fields. He described a recent survey of ice consumption by households equipped with mechanical refrigerators and said that 20 to 80 per cent of these households buy ice—mostly on a cash and carry basis. It offers a really good volume market but special handling and specific promotion are required. Details were given from the survey to guide ice men in setting up their program to promote this field. Mr. Austin urged all of them to study their markets and develop every avenue of sales along the lines shown by the market studies.

Merchandising

A complete merchandising program was described as the key to the future by spokesmen on a local and national level. Charles Anderson, Fort Madison, Iowa, president of the Illinois Ice Merchandising Council, described what this organization offers to association members to aid them in accomplishing necessary promotional and sales work. The Council, he said, is fully organized, has good workable ideas and National backing, and is ready to go. Primary need is the general support and participation of the ice men. The valuable aids thus offered include a general clearing house for information and guidance on merchandising which includes details of what others in the state and nation are doing and accomplishing. Sales contests and methods can be evaluated, cost factors can be properly judged and suggestions can be obtained to meet service problems.

Mr. Anderson declared that it is important to give sales personnel inspiration and enthusiasm for their work. This is another advantage of full participation in the ice merchandising council which Mr. Anderson urged all to join and use to their advantage. He concluded with helpful examples from his experience in promoting and selling ice-using equipment.

1950 Officers

President, O. C. Curtis, Pekin

Vice-president, James Stublefield, Cairo

Secretary-treasurer, W. D. Wright, Clinton

New directors elected are: Arthur Brown, Salem; George Rettof, Streator; Frank Pereboom, Jerseyville; John Glenn, Beardstown.

Sales and Promotion

A sincere and positive analysis of present sales and promotional requirements was presented by Dan Prager, National Director, Personnel Training and Marketing. Every factor in the industry situation, he said, demands sales of ice and ice-using equipment. Many industries have been encouraged by war-inflated demands for their products, but they are now facing a situation where they must build volume through every possible avenue in order to maintain their position. It is quite evident that the ice industry faces such a situation although it has been slower than most to realize that the era of automatic demand is past. Managed selling is thus an absolute requirement to insure a good future for the industry, Mr. Prager emphasized. To further underline the seriousness of the present situation, he quoted data to show how sales for household refrigerators during the past two years have dropped to the low figure of little more than 100,000 for the country as a whole.

He pointed out that much of the ice consumed during recent years went into equipment sold previously. Unless it is augmented by new sales, the ice consumption will reduce in the future. The industry, Mr. Prager said, must develop greater interest among its owners and managers and they must possess a willingness to follow through on real sales and promotion programs. He described the organization and operation of a really effective merchandising program including service and sales training. Then he gave details of the valuable assistance which his department provides in carrying out such programs.

Rental plans which have been utilized in some sections to place a large number of refrigerators in customers' homes within a short period of time were discussed by Bob Stevens, Ice Cooling Appliance Corp. and John Kader, Progress Refrigerator Co. Mr. Kader also described a new bottle cooling chest which has been produced at the suggestion of beverage bottlers. The beverage distributors are

seeking the assistance of the ice industry to further the sale and use of these coolers along with picnic chests—both of which promote the sale of beverages and ice.

Engineering and Production

A session on plant modernization and operation showed what good engineering would accomplish for cost reduction and was concluded with a lively question and answer period.

The various elements of a typical ice plant were described by Eugene Rytlewski, Westerlin-Campbell Co., Chicago, who told how to maintain the operation of each at its best efficiency. He stressed the fact that many plant operators seek big solutions for their problems while actually, careful attention to the details of plant operation and maintenance frequently will produce great benefit. For instance, proper cleaning of condensers, removal of oil from the system and discharge of non-condensable gas may not receive sufficient attention and may result in faulty operation as well as greater costs. Mr. Rytlewski gave details of condenser surface requirements and water quantities needed for best results.

How a minor modernization program can pay off with remarkable benefits and results was described by James Oldani, Central Illinois Ice Co., Springfield. First Mr. Oldani declared that the plant engineers should be alert and well-informed in order to get the best out of their plants. He complimented the National Association of Practical Refrigerating Engineers for its training work and aid to operators of refrigerating plants. He urged the engineers to join this association and benefit from the facilities it provides. Mr. Oldani then gave the details of a moderate plant modernizing program completed early in the year in a 700 can ice plant combined with a cold storage. The work included changes in the condenser water circulating system, larger condenser liquid drains and proper installation of the valves and connections. A new accumulator with float switch was installed and the size of the ammonia suction main was increased. The coils between the cans were reconnected to provide each coil into two parallel circuits and larger suction headers were applied. At the same time, two cold storage coolers were repiped and converted to sharp freezers at minus 10 F. which increased the storage load.

As a result of the changes ice production was increased 30 per cent although one 8 x 8 compressor was no longer used on the ice tank and allocated to the cold storage to take care of the larger load. Yet with this increase production and greater cold storage load, the overall power consumption of the plant was reduced. The cost reduction during four months' peak period last summer amounted to almost $1,000 so that the modernization will be paid for in a relatively short time.

The fundamental factors in safety and accident prevention were discussed by Emerson Brandt, ICE AND REFRIGERATION, who first pointed out some of the electrical hazards found to exist in numerous plants. He urged regular inspections to insure that wiring systems are properly installed and provided with modern protective devices. Careful maintenance, he said, is just as important as good equipment. For instance, loose connections cause heating and may result in fires. The design standards of the national safety code for refrigeration plants should be followed whether local ordinances and regulations require this or not. Mr. Brandt emphasized the desirability of applying relief valves to all pressure vessels and the use of high pressure cutouts on compressors. He concluded with detailed suggestions for the training of workmen and instructing them in safe practices.

The session was concluded with a panel discussion in which three speakers were joined by James Stublefield, Cairo and Edward Brown, Ft. Madison, Iowa.

The new provisions of the Illinois Unemployment and Compensation Act were discussed by Frank Welch of that division in the state government. He explained how the graduations have been changed in the various rate steps which would give benefits in addition to the specific rate reductions embodied in recent amendments. The new eligibility provisions were explained and suggestions were given of proper and convenient methods for reporting to the department. The probable savings under the new rates promised to be substantial. Mr. Welch said that when 1947 collections were refigured on the new basis, there is an apparent saving of 8 million dollars or 18 per cent of what was actually paid in that year.

In the customary fashion the convention was opened with a Get-Acquainted Party on the evening of December 14 and this was followed by a short meeting of the board of directors. The following evening featured the convention banquet with an excellent program of entertainment which all of the attendants enjoyed.

Missouri Ice Manufacturers Association

By V. A. ESPHORST, Secretary

THE 25th annual convention of the Missouri Ice Manufacturers Association will be held January 9-10-11, 1950, at Hotel President in Kansas City, Mo. The sessions for the convention are being patterned after the National Association of Ice Industries Convention held in New York since many of the Missouri members were unable to attend the National Meeting.

Some of the speakers who will appear on the program are as follows: T. J. Krauss, executive vice-president, Associated Industries of Missouri; Walter W. King, regional director, Wage and Hour Division, U. S. Department of Labor; Robert T. Thornburg, commissioner, Missouri Department of Agriculture; R. C. Miller, Swift & Co.; L. L. Swartz, Irvington Ice & Coal Co., Indianapolis, Ind.; Walter H. Rathert, Chouteau Avenue Crystal Ice & Cold Storage Co., St. Louis; Karl Pflanz, St. Clair Ice Co., Belleville, Ill.; M. J. Garvey, Jr., Artesian Ice & Cold Storage Co., St. Joseph, Mo.; Daniel A. Prager and Guy W. Jacobs of the National Association of Ice Industries. The U. S. Department of the Interior, Fish and Wildlife Service film "Retailing Fish" will be shown.

The Entertainment Committee, under the able leadership of Chairman Harold Margolin, is planning a floor show that will outshine all previous shows.

Oklahoma Association of Ice Industries

By W. A. HADLEY, Secretary

THE 46th annual convention of the Oklahoma Association of Ice Industries will be held in Tulsa, January 22, 23 and 24, 1950. The Mayo Hotel will be convention headquarters. The entire 16th floor of the hotel has been set aside for the needs of the convention.

Walter McGee is chairman of the Program Committee, K. F. Addison, chairman of the Reception Committee, and George Hancock, chairman of Entertainment.

A program is being worked out to fill the needs of the industry under existing and future marketing conditions. Plans for top entertainment are under way and those who are there will have plenty of fun with old and new friends. The exhibitors will have a good line of merchandise on display.

Those who plan to attend are urged to make their hotel reservations promptly.

Canadian Association of Ice Industries Annual Convention

THE annual convention of the Canadian Association of Ice Industries was held at the General Brock Hotel, Niagara Falls, Ontario, November 8 to 10, 1949. This was the second meeting of the association in 1949, made necessary by the decision of the Directors to change the time of the convention from Spring to Fall. All who attended, both ice dealers and associate members, were enthusiastic about the new time and there is no doubt but that future Canadian conventions will be held at about the same time of the year. As a matter of fact a motion was passed at a directors meeting held during the convention, setting the date of the 1950 gathering as during the week immediately preceding the National Ice convention.

Attendance at the Niagara Falls convention and both number and excellence of displays was far in excess of any previous Canadian ice convention. The program was packed with topics of current interest to the Canadian ice industry and highlighted with speakers of unusually fine calibre.

The first day was devoted entirely to getting delegates settled comfortably in the hotel, a scenic tour through the Niagara Peninsula as guests of the Ontario ice dealers, a meeting of the Directors during the late afternoon and a family cocktail party during the evening.

The Wednesday morning session opened with an address by the Executive Secretary entitled "New Problems —New Opportunities" which was the theme of the Convention. This was followed by an address on "Personnel Selection, Training and Supervision" by I. Greenberg of Toronto; "Profitable Public Relations" by W. W. Staples, Toronto; and "Building Prestige for Ice" by Cyrille J Lorne, President of Canadian Magazine Publishers Association.

The ladies of the Convention enjoyed a delightful luncheon at the Park Restaurant overlooking the American and Canadian Falls as guests of the Ontario ice dealers while the men of the Convention lunched according to their own plans.

The afternoon session opened with a talk by M. J. Kennedy, General Manager of one of the leading Canadian ice refrigerator manufacturers on "New Sales Appeal—New Ice Refrigerators". The purpose of this adress was to draw attention to the brand new refrigerator models displayed at the covention for the first time, embodying the most modern streamline design. Mr. Kennedy's address was followed by Thomas G. Rogers, Toronto, speaking on "Extending our Membership"; a dramatic presentation of Canadian National Ice Advertising under the title of "The Key to Better Business"; "Selling Plans for Ice and Ice Using Appliances" by Harvey Smith of Toronto and "How We Do It In Our Community" by Cecil W. Goodrich, Vancouver, B. C.

Wednesday evening was the time of the Presidents Party at which one hundred and sixty sat down for dinner and enjoyed a glorious evening.

The Thursday program commenced with an "Early Bird's Breakfast" at 8:30. This convention event as in previous years was surprisingly successful with 80 per cent of the total registration attending.

Harrison D. Sanford, Syracuse, N. Y., opened the morning session with a most interesing and informative talk on "Processing and Handling of Ice". This was followed by "Developing Market For Commercial Ice" by J. E. T. Dade, Toronto; "Observations Across the Country" by Reuben E. Greenberg, Toronto, and a joint presentation by Robert Free, San Jose, Calif. and S. B. Wimperis, Ottawa on "Vending Machines".

Reuben Greenberg had just returned to Toronto from a trip which took him as far west as Los Angeles and San Francisco. During this trip he called at many ice plants and carefully studied their operation methods.

The afternoon and closing session took the form of an ice plant management conference which opened with luncheon. Topics discussed included winter preparation for next season, hot weather production, condensers and cooling towers, round table discussion. M. S. Horn of Montreal acted as chairman and N. A. Fairhead of Toronto as conference director.

All 1949 officers were elected for another term as follows:

Officers and Directors

Honorary President, H. J. Fairhead, Toronto.
President, L. G. Wilkins, Stratford.
Vice-president, C. W. Goodrich, Vancouver.
Treasurer, J. E. T. Dade, Toronto.

Five new Directors elected were: A. A. Crowe, Truro, N. S.; C. W. Goodrich, Vancouver, B. C.; J. J. Dolan, Saint John, N. B.; A. H. Campbell, Grimsby, Ontario; A. W. Williams, Toronto, Ontario.

Chairmen of Standing Committees; Advertising, Cameron Hillmer, Oakville; Sized Ice, I. Greenburg, Toronto; Public Relations, W. W. Staples, Toronto; Finance, J. E. T. Dade, Toronto; Membership, Gordon Marsh, Windsor; Refrigerators, John McGoey, Kitchener.

Delta States Ice Association

THE annual convention of the Delta States Ice Association was held at the Buena Vista Hotel, Biloxi, Miss., November 28 to 30. Among the speakers were Geo. Steers, Jr., Kalamazoo, Mich.; Dan Prager, National Association of Ice Industries; J. C. Ruppert, Little Rock, Ark., State Supervisor Trade and Industrial Education; Harold W. Faint, Chicago; Wm. T. Jobe, National Association of Ice Industries, and Thurman Sensing, director research, Southern States Industrial Council, Nashville.

A luncheon for the ladies was given at the White House at noon Monday and a bingo party was held that evening. The annual banquet, floor show and dance was held Tuesday evening. The annual President's dinner for officers, directors, past presidents and their wives was held Sunday evening at Paradise Point.

Wm. T. Jobe, general counsel for the National Association of Ice Industries told the convention that the comparatively cool summer was the chief cause of a drop in ice sales. Regarding 1950 he said, improved economic conditions should provide a real boom. He discussed briefly the new Wage-Hour Law, pointing out its chief provisions as they apply to the ice industry.

Joe Henry Morris of Jackson, Miss., referring to decrease in sales of ice over last year said the only way to check this drop is through better service. He said it is essential that ice service be improved in every way possible and suggested that smaller plants might find it necessary to establish an auxiliary business. He said a small plant under 15 tons in a rural community will not make the grade on its own power.

Geo. Steers, Jr. of Kalamazoo, Mich., and past president of the National Association of Ice Industries declared that there is a very expanding need for ice and the service it provides. He pointed out that just having a product, selling at a low price, is not encugh to be in the parade of American business success. He said if merchant has a good product and a good service, put out where the public wants it in the form in which they want it, the public will pay for it. He also commented that the service furnished by ice companies is not what it should be—"the service is

poor to bad and it is not improving at a rapid rate," he concluded.

Ice men must become merchandise minded to a degree never before known in the ice business, according to Dan Prager, Director of the Personnel Training and Marketing Department of the National Association of Ice Industries. Part of the decrease in ice sales, he said, is the direct result of inefficient, careless service. Ice companies, he said, should realize that their future is largely dependent upon aggressive merchandising of properly constructed ice-using equipment. Regarding new fields for the sale of ice, over a million tons of ice are being bought by mechanical refrigerator owners for auxiliary ice, he said. Other fields in which ice sales are increasing are vegetable icing, uses in hotels, restaurants, hospitals, taverns, icing milk, poultry and fish.

Thurman Sensing, Director of Research, Southern States Industrial Council, Nashville, gave an interesting and enlightening talk on lessons learned from Britain's experience under socialism.

Merchandising Forum

The Tuesday forenoon session was taken up with a merchandising forum conducted by J. C. Ruppert, Arkansas State Supervisor, Trade and Industrial Education, Little Rock, former superintendent of National Ice Marketing Institute; assisted by Lester W. Godwin, Arkansas Ice & Storage Co. Inc., Blytheville, Ark.; H. M. Hurst, Standard Ice Co., Brinkley, Ark.; Jobie Harris, Morris Ice Co., Jackson, Miss.; Clifton Baillio, Ice Service Delivery, Inc., Alexandria, La., and Paul Gibbs, Fulton Ice & Coal Co., Fulton, Miss.

Two films were shown "A New Market for Two Billion Pounds of Ice" by H. S. Pablo, Dairy and Poultry Dept., Swift & Co., Chicago, and "Retailing Fish" through courtesy of Elliot Macklow, Visual Aids Specialists, Department of the Interior, Washington, D. C.

Harold W. Faint, sales manager, Industrial Filter & Pump Mfg. Co., Chicago, gave a talk on "Demineralized Water for Ice Plants."

The subject of automatic ice plants was covered by W. J. Ayers, Standard Ice Co,. Memphis, Tenn., and J. H. Harris, Ice Service Delivery, Inc., Alexandria, La.

At the final session, officers and directors were elected for the coming year as follows:

Officers

President, R. H. Hunter, Paragould, Ark.
Vice-president, C. C. Tebbetts, Minden, La.
Vice-President, J. C. Phillips, Hattiesburg, Miss.
Treasurer, E. L. Wise, Warren. Ark.
Secretary, R. N. Milling, Monroe, La.

Indiana Offers Training for Drivers

A DRIVERS training program has been established for the Indiana Asosciation of Ice Industries to be given by the Distributive Education Department of Indiana University. Short courses will be offered through evening classes in a number of Indiana cities, making it possible for employees of all ice companies to participate.

G. Elwood Hookey of the university staff, following a conference with Dan Prager, director of the Personnel and Marketing Department of the National Association of Ice Industries in Washington, reports that he has prepared a very interesting program for the Indiana ice industry. About 75 per cent of the ice companies in Indiana are expected to participate.

Municipal Ice Plant Sales Decrease

SALES of ice by the ice plant of the Metropolitan Utilities District, Omaha, Nebr., continue to fall according to a recent news report. A financial statement reveals that ice sales dropped 40.7 per cent in the first ten months of this year compared with a like period last year. In the past twelve months an operating loss of $25,235 was charged against the plant.

Ice was made, according to the report, at an average cost of $6.82 a ton and was sold for $5.38. Approximately 80 per cent of the production was sold at wholesale price to railroads, peddlars and the Metropolitan Utilities District itself for air conditioning. About 20 per cent was sold to the public at retail. For the ten months ended October 31, an average of $2.17 per ton was lost on ice sold for icing railroad cars. Loss per ton on ice sold at retail was $2.05 per ton and for sale to peddlars 15 cents per ton.

Except for 1934 and the years during and just after World War II, the ice plant has lost money every year since 1931. In 1940 some of the directors sought to have the plant closed but other directors led a successful fight to keep it in the ice business. In 1941 Comptroller A. L. Adams estimated that closing the plant would probably save the publicy-owned utility upward of $8,000 a year.

Fort Worth Ice Industry Advertises in Anniversary Number

WHEN the Fort Worth, Texas, Star Telegram recently published a 480 page anniversary edition, a number of Fort Worth ice firms took advertisements to detail their history and to tell of their service to the public.

One page advertisement representing the ice industry of Fort Worth plays up the fact that 1949 is also the 100th anniversary of the ice industry. Since Dr. John Gorrie patented the first practical ice process for making ice, it says, the ice industry has grown into one of the nation's largest. It points out that 6800 plants last year produced enough ice to make a super highway 90 ft. wide and 12 in. thick from New York City to San Francisco. The thirteen plants and 595 employees of the Fort Worth Ice industry, it continues, are engaged in supplying the vast quantities of ice needed to safeguard perishables and contribute to year-round better living in that great city.

Virginia Ice Manufacturers' Association

THE 35th annual convention of the Virginia Ice Manufacturers' Association will be held at the Monticello Hotel, Charlottesville, Va., January 25 and 26. The business program will include discussion of the new Wage and Hour Law, paper bags for crushed ice. Talks on refrigeration and general discussion of the ice business. The entertainment program will include two luncheons, a dinner and dance, a luncheon for the ladies at the Farmington Country Club, sightseeing for the ladies, and golf at the Farmington Country Club course.

St. Louis Association of Ice Industries

AT THE annual meeting of the St. Louis Association of Ice Industries held on December 12 at the Hotel Sheraton in St. Louis, the following officers were elected:

President, Walter H. Rathert, Chouteau Ave. Crystal Ice & Cold Storage Co.

Vice-president, Paul E. Conrades, Merchants Ice & Coal Co.

Secretary, Arthur W. Bramstedt, J. H. Bramstedt & Sons.

Treasurer, Joseph A. Giljum, Artificial Ice Co.

The Practical Refrigerating Engineer

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A Program of Education for the Operating Engineer

By H. G. Venneman

Professor of Refrigeration, Purdue University, Lafayette, Ind.
Chairman, Educational Committee N.A.P.R.E.

IN FEBRUARY of this year I wrote a letter to all members of the Educational Committee and to a few of the National Officers asking them to give me their ideas on the problem "What material should the educational committee publish that will serve best to help new men to become good operating engineers." I offered to prepare with their help an entirely new course of lectures for these beginners on a lower school level than anything which had been offered previously—material which would not be above the heads of these men.

I am sure that you will be interested in their replies.

Elmer Johnson who is instructor at Los Angeles Chapter answered as follows: "I am in full support of your worthy and commendable offer to prepare an additional course to benefit those members who find the present text too difficult.

"The majority of the men in attendance at the preliminary class in the Los Angeles section appear to have a good knowledge of the basic physics of refrigeration. However, there are always new members who require more fundamental data than that now obtainable.

"As suggested material content for this proposed lecture course I would like to mention the following:

(a) Lessons on basic physics, chemistry and electricity complete with examples, applications, and problems.
(b) A math review or refresher course.
(c) Fundamentals of hydraulics.
(d) Elementary mechanical drawing and blueprint reading.

"There will doubtless be some duplication of material contained within the proposed course and the present one, but I believe that if simplicity is stressed it will bridge the gap that now exists between the beginner's background and the present text.

"I have evidence that when the beginner or apprentice has received instruction on the above mentioned suggestions the present text is then understandable to him."

Professor Arthur Hill of New Orleans Chapter writes as follows:

"As you know, I have used your text in our New Orleans classes. I think the material is well presented. If any revision is made I should like to see CO_2 discussion eliminated, as I believe that has not too much value at the present.

"Some simple arithmetic formulas, such as the area of a circle, volume of a cylinder, etc., might be placed on a page toward back or front.

"I believe additional problems would be desirable, with answers in most cases. These men work their problems unaided, and do not have benefit of discussion groups between classes, as our students do.

Ideas on what constitutes an adequate and acceptable program for the education of operating engineers in refrigerating plants were solicited by Professor Venemann. Replies proved to be considerably varied in their summation of present needs. These are stated along with the conclusions reached by Professor Venemann in the light of his extensive experience in teaching and as head of the N A P R E Educational Committee.

'One difficulty I found was irregular attendance of enrollees because of change of watch. Management may need to be "sold" on the importance of a man continuing a course, once he has started, and to alter the fixed watch schedule if necessary.

"You have doubtless seen the outline of the Southwestern Ice Manufacturers' Association course held this year at Texas A. & M. college. Registration fee was $25.00. I have had no specific report of the work there."

Leroy Etzel of San Francisco thinks that —

"Problems with answers would be of benefit to members at large who do not have the opportunity to attend our meetings.

"Working out problems on the blackboard in meetings induces beginners to ask questions and enter into discussions, which arouses their interest and makes them regular attendants.

"A course of lectures for members on a lower school level would be beneficial to those working night shifts who do not have the opportunity to attend regularly."

Elliott Hallowell of the Dallas Chapter says: "There are several things which would seem to be of advantage in teaching which are not now available.

Presented to the 40th Annual Convention, NAPRE.

"One is additional information on small low-pressure units and medium size units, such as are used on small air-conditioners. Quite a number of our members have small auxiliary plants which they operate. We are also beginning to acquire members from some of the larger air-conditioning installations and need additional information on large centrifugal and high-tonnage Freon machines as regards operating data. I don't know whether this condition is peculiar to this part of the country or whether it is general.

"It would also seem that some operational charts would be valuable, showing proper relationship between condenser water temperatures, condensing pressures, liquid temperatures, etc. These could be tied in with the ammonia charts in class and the operators could have separable charts which could be mounted in their engine rooms for ready reference.

"We are a relatively new chapter in this section and the above items seem to meet the general approval of the membership."

A. G. Loeffel of St. Louis has some unique suggestions: "It is my candid belief that we should first do a good job of indexing and again cross indexing, so as to make readily available with less search, the wealth of perfectly good material that is now available. I do not think we can ask of you, or our Committee, the kind of time that it would take to prepare a new text and a new course outline. All of us are too busy and besides the membership have no moral right to expect a college education for $7.00 per year.

"Don't you suppose that if all of us divided up the job and we got busy on the indexing scheme of things that that would comprise the simplest answer and one which is well within the reasonable limits of our time and money at our disposal? Otherwise, I would suggest that we try to arrange matters so that you can make trips to the various Chapter meetings about once a year or have regional meetings and put forth a real educational program for each Chapter."

R. A. O'Neill of Corpus Christi wrote as follows: "I am sending you, under separate cover, my office copy of text material which was prepared by various members of our Texas Ice Industry, and which was used in a one week's Short Course at A & M College the last week in January.

"Without claiming any credit for my part of this material, I do believe that it is about what our average ice plant and cold storage operators are in need of, in that it is practical and mostly in corn field language.

The course content consisted of short discussions printed on letter sized paper and covered the following topics:

Fundamentals of Refrigeration, (3 parts).
Water Treatment for Ice Manufacturing.
Efficient Operation of Ice Plants.
Efficient Operation of Condensers and Receivers.
The Efficient Use of Power in Ice Plant Operation.
The Efficient Operation of Cooling Towers.
The Efficient Use of Ammonia in Ice Plant Operation.
Accident Prevention During Plant Maintenance.
Treating Water for the Manufacture of Ice.
Good Housekeeping of Ice Manufacturing Plants.
Keeping and Using Log Sheets.
Purposes of Fundamental Pieces of Equipment in Ice Manufacturing Plant (5 parts).

President George Koehne had some interesting observations, "I have been thinking of you for several days and wondering how you are getting along with the new study course. I was very anxious to get something started as the ice industry as a whole is in need of engineers with some refrigeration knowledge. It isn't only the ice industry but the building managers around here are having the same trouble. Most of our large buildings and hotels have year around air-conditioning.

"I was on the program of the Kansas Association of Ice Industries Convention recently and I was told by several plant owners from the convention floor that they watched the N.A.P.R.E. section in ICE AND REFRIGERATION and had learned considerable from those articles. They felt that we were doing a good job. It seems that our biggest job is to get the engineers to read these articles.

"I agree with you on everything you stated in your letter and I do not believe in half doing things. On the other hand the movie producers try to give the public what they want, we have a demand for a lecture course on a lower school level. Let's try to meet this demand. McGraw-Hill Publishing Co. has come out with Operating Engineer and Technical Publishing Co. of Chicago came out with Plant Engineer, trying to reach the small plant engineer. The information that I have is that they are both going over good. Let's try to give them what they want."

Bert McKenna, San Francisco wrote: "In my experience I found the most help in a text giving the question and answers in simple refrigeration, with the proper instructor and a follow up of your text, Refrigeration Theory and Applications should do the trick."

Comments by A. R. Carlson, Chicago, are worth noting because he thinks we are doing a pretty good job with our present text books. "I am afraid I cannot add much light on the subject that you request, namely, an entirely new course in refrigeration for beginners.

"Personally, I have never been in agreement with the members who state that our present two lecture courses are above the head of the ordinary fellow. As I see it, both your text book and Principles of Refrigeration cover the subject about as simply as possible to develop a refrigeration engineer, and it seems to me that that is the prime purpose of the association, but some of our members apparently wish to develop just valve twisters. For this I don't think we need any text at all. Actually to cover either text all a man needs is a little knowledge of arithmetic and a very little algebra. I think the association is distributing two fine books, and for my part would hate to see them go to something that is worth practically nothing to most of our members."

What is Expected of the Practical Refrigerating Engineer?

Before outlining a program of education for the practical refrigerating engineer it would be well to survey his responsibilities and to find out what is expected of him. An analysis of the topics and courses suggested by the members of the educational committee and other officers of our association for the young engineer clearly indicates that he is expected to become quite versatile and will require better than average intelligence. While some of the material proposed may not be appropriate for the beginner it is quite evident that most of it and a great deal more will have to be learned before he is able to do all that is expected of him.

Since the practical refrigerating engineer gets his pay for operating and maintaining the equipment under his care so that it will yield the greatest benefits to his employer, it becomes apparent that he must understand how it functions, and that he must be able to keep it in good working order.

A List of Major Equipment

Many refrigerating engineers must generate steam power and thus must be familiar with power plant equipment, boiler feed water treatment, cooling towers, electric generators, controls, etc. Others using gas turbine or Diesel

power have their special problems. In the hotel business the engineer must be familiar with the power plant, electric lighting, heating and ventillating system, telephone switch board, elevators, pumping, distributing and treating systems for hot water, cold water, soft water and fire water. Erich Utescher could suggest several others which I have failed to mention.

In the ice making and cold storage industry he may have most of the above equipment under his supervision in addition to the refrigeration machinery, and furthermore he is responsible for the quality of the ice he makes, and for the safe preservation of the food products entrusted to his care. There are many angles to his job. To learn them all he must keep eternally at it, getting information from any and all available sources. In other words—to become a high class operating engineer one must eventually become a well educated man—and by educated man I am not inferring that he must be a college graduate. There are many ways of becoming educated without going through college. But there is no way of becoming educated without years of hard work and study. In fact a college graduate is not worth very much as an operating engineer until long after he has left his alma mater and learned the practical end of the business in the school of experience.

Prerequisites for a Good Operating Engineer

To become a good operating engineer a man must possess two essential qualifications: (1) a burning ambition to succeed and (2) the capacity to learn. These are the qualifications that have made a man rise from obscurity to fame in his chosen profession. With these two qualifications he will vigorously seek the information he wants. "Seek and ye shall find, knock and it shall be opened unto you."

The man who is ambitious to succeed will take advantage of every available opportunity to learn. He will read the trade journals, he will fraternize with fellow operators and exchange experiences with them; he will take a lively interest in the educational programs of the local NAPRE Chapters. In fact he will develop his own program. If he is not ambitious he will do none of these things, but will content himself by drawing his pay and just getting by. No program of education will be of much help to him. He will be like the mule which refuses to drink even when lead to the water. The indolent man needs no program of study—he needs a burr under his tail. Most men fit in somewhere between these two extremes where a program of education will undoubtedly be very helpful.

Available Sources of Study

Our public grade schools stress a fundamental education in the three R's readin', 'ritin', and 'rithmetic. Our high schools continue the three R's and introduce those who would pursue engineering into the basic sciences of algebra, physics, chemistry and drawing. All of these courses are hundreds of years old and are considered necessary for the normal progress of any man who desires to understand the functioning of mechanical equipment. If an employee wants to become a good practical operating engineer and is deficient in any of the above elemental courses he should ferret out the needed information from any and all available sources until he has bridged the gaps. This does not have to be accomplished in a month or year, but it should be done. To do it, however, requires courage and ambition.

Our universities have established technical extension departments in the larger industrial centers where men who work for a livng may attend classes.[1] They also maintain correspondence courses in the basic subjects.

Then there are many reliable trade schools and institutes which give both resident and home study courses.

All of these require the expenditure of time and money. A home study course in English or in Algebra will cost the student or some branch of the government from twenty to fifty dollars each, depending on the number of students enrolled and whether it is administered by a profit or non-profit organization. A correspondence course in a specialized subject such as refrigeration will cost the student from two to five hundred dollars.

An organization like the National Association Practical Refrigerating Engineers is by all odds the least expensive of any as a source of study, partly because it is a non-profit organization and partly because most of the instructional work is done gratis. In fact in most Chapters no one is paid except the class instructor. All of the speakers donate their services for the benefit of the members. And yet some of the members think that they should be given more for their money.

The Federal Government, realizing its responsibility to the boys whose educations were disrupted during the war, is spending billions of dollars of the tax payers' money to repair the damage. G.I.'s interested in taking advantage of this liberal government policy should contact their local Veterans' Administration. Likewise the Federal Government through the Smith-Hughes act has been giving financial aid to study groups for many years. For information on this consult your high school principal.

I think that every employer of engineers should have a well appointed reading room for the use of his engineers. This library should be supplied with catalogues showing the equipment in the plant, current technical magazines, a half dozen or more text books pertaining to the business.[2] He should encourage study on the part of his employees, and provide opportunity for them to attend lectures, group meetings, study courses, plant visitations and all other media whereby the employee will be stimulated to become a better engineer. Not the least of the stimulants for ambitious effort might be adequate compensation. Fortunately effort and compensation go hand in hand.

The Program of Education

Up to this point in this paper we have discussed the following topics:

(1) Material which the educational committee should present to the operating engineer.

(2) The things that the practical refrigerating engineer is expected to know and to do.

(3) The available sources of study.

(4) A partial list of books on refrigeration.

The concluding topic, namely the Program of Education, will be presented from the standpoint of the individual operating engineer. It is his personal responsibility to undertake and faithfully pursue a plan of progressive study—this we will call his program of education. It is his job to bridge the gaps of things unknown to him and to learn to do the things necessary for his own per-

[1] For a complete list of Refrigeration and Air Conditioning Schools see the 1947 report of the ASRE Committee on Education.

[2] A very incomplete list of recommended books:
Principles of Refrigeration, by Wm. H. Motz.
Refrigeration Theory and Applications by H. G. Venemann.
Data Books, No. 1 and 2, by American Society of Refrigerating Engineers.
Application Data, bulletins 1 to 49 and to date, by A.S.R.E.
The Heating, Ventilating and Air Conditioning Guide, by the American Society of Heating and Ventilating Engineers.
Mechanical Engineers' Hand Book, by Lionel S. Marks.
Refrigeration Note Book, by Paul B. Reed.
A set of Operating Data Books, by the N.A.P.R.E.

sonal development. The most difficult case involves the individual who is new at the business and who failed to complete his common school education. He is the one who must learn enough of algebra to understand the mathematics involved in the articles he reads in the trade journals and in the text books; just enough of chemistry to follow instructions when testing for water hardness or pH value of brines; and enough of physics to appreciate the basic laws of nature as they apply to the production of power and heat cycles.

His plan of study would follow this pattern: First, he would learn to do well the manual tasks assigned to him, and second he would learn why things perform as they do. This program will require several years of apprenticeship under good tutelage. This long period of apprenticeship is the normal procedure, but the good tutelage is not always obtainable. Too often those responsible for the development and progress of new employees are not good enough engineers themselves to do a proper job of training others. Too often they are like the blind leading the blind.

Personally I have been deeply indebted and very grateful to my first boss, Mr. George Vail, Superintendent of the Colorado Ice and Cold Storage Company in Denver, who gave me every opportunity to learn. His three engineers, his master mechanic, his cold storage foreman and all others with whom I worked were helpful to me in every way. If I were a young man eager to become an operating engineer I would hesitate to take a job in a plant which would not assure me good tutelage. On the other hand if I were an employer I would hesitate a long time before I would undertake to train a man for a position as engineer if he lacked the ambition or mentality to become a reasonably good one.

The National Association Practical Engineers was organized forty years ago for the sole purpose of raising the standards of the operating men through education. During these years it has published hundreds of articles in its official organ, Ice and Refrigeration, for engineers to read. It has organized local Chapters throughout the country where it has helped thousands of engineers through educational programs; which have included class instruction. lectures, discussions, entertainment and plant visitations. It has officially adopted two text books, edited by experienced operating engineers, Motz's "Principles of Refrigeration," and my own "Refrigeration Theory and Applications." Neither of these text books cover all the needs of men either in the operating field nor in technical schools, but both of them in the hands of capable instructors will do a pretty good job. Neither of them attempts to teach the three R's, readin', writin', and 'rithmetic.

Through the columns of ICE AND REFRIGERATION the NAPRE has answered hundreds of questions sent in by members from all over the world. And finally, not the least of its program of education has been its national conventions and the proceedings of the conventions as well as other study and reference material published in the Operating Data Books.

A roster of its officers past and present will disclose the names of hundreds of competent self sacrificing men who have without any financial remuneration devoted years of service for the benefit of the industry and their fellow engineers. The organization extends open arms to any worthy candidate for membership at a price which is ridiculously low—in fact less than the cost of a good electric iron, or a pair of shoes. Because of its accomplishments during the past forty years and its possibilities for service in the future, we earnestly solicit the support and cooperation of both labor and management in carrying out a better and more effective educational program.

N.A.P.R.E. Question Box

NOTE: H. G. Venemann, Chairman of the Educational Committee, has agreed to answer through this column all questions asked by members of the N.A.P.R.E. Please send your questions to him care of Purdue University, West Lafayette, Ind.

Condenser Equalizing Line

Question No. 832: If the liquid refrigerant drain from the condenser to receiver is installed in adequate size, is it necessary or beneficial to install an equalizing line from the condenser to the receiver?—M.S.S.

ANSWER: This question was answered very thoroughly in the 1944 Operating Book by Robert C. Doremus a former member of the Educational Committee.

If the drain from the condenser to the receiver is "adequate" no equalizing line is necessary, but the question arises as to when it is "adequate." It is adequate when it will permit the flow of liquid to the receiver and at the same time permit the counter flow of gas back to the condenser. In other words the drain line should never be completely full of liquid. There must be a space above the liquid to permit the gas to pass back to the condenser. Should it be impossible to provide a downward slope in the drain line from the condenser to the receiver, or impracticable to install a line of sufficient diameter to drain the liquid from the condenser without interrupting the return of the gas from the receiver to the condenser, an equalizer line should be installed. The probable temperature of the receiver in comparison with that of the condenser has a serious effect upon the size of the drain line. For example let us assume that the liquid leaving the condenser is saturated at 86 F, while in the receiver it is heated to 90 F. The condenser pressure will be 154.5 psig while that in the receiver will be 165.9 psig. This 11.4 psi differential pressure would force the liquid out of the receiver and back up into the condenser unless some of the gas from the receiver is allowed to return to the condenser and thus equalize the pressure in both vessels.—H.G.V.

Revarnishing Motor Windings

Question No. 833: We realize that it is a good practice to clean out electric motors at least once each year and to do this more frequently where the accumulation of dust and dirt in the windings and parts is more rapid. In addition some plants make practice of revarnishing the windings or coils at regular intervals. Is this a good practice?—J.R.H.

ANSWER: The 1944 Operating Data Book also contains an excellent article by our Chicago member, J. R. Watson, on the Maintenance and Repair of Motors. He discusses the matter of checking and drying out the insulation, cleaning out the dust, and the matter of revarnishing. He also discusses the problem of replacing motor brushes. It is not very often necessary to revarnish the windings or coils. However if the motor is sent to a repair shop or service department for other repair, the revarnishing may then be justified on the basis that the additional cost at that time would be very small.—H.G.H.

Replacing Motor Brushes

Question No. 834: Two of our electric motors need new brushes. Will you please describe the best procedure to follow in renewing these brushes so that operation and wear will be on the best basis.—J.R.H.

ANSWER: In answer to this question let me quote Mr. Watson from page 57 of the Operating Data Book mentioned above.

"All D. C. machines in the first place must have the proper type of brushes in order to get proper maintenance.

It is generally the best practice to buy the brushes from the manufacturer that makes the equipment, because he knows better than anybody else the characteristics of the machine and thereby knows what is the best type of brush to use. Many a D. C. machine has been badly damaged by some purchasing agent not knowing what he has to do, except to look at the dollar sign, and buy cheap brushes from some motor maintenance company that is not familiar with the type of brush to be used for the machine in question.

"The brush holders should be set, in general, so they are ⅛ in. from the commutator and the brushes should be equally spaced around the commutator. On a four pole machine there will be four sets of brushes. These then should be spaced on equal quarters around the commutator. There are some exceptions to this on some types of D.C. machines, such as streetcar trolley equipment which even though it is four pole, only has two sets of brushes. The proper tension on the brushes is very important. Usually this is set at about two pounds per square inch of brush surface. Any lighter pressure than this is liable to cause sparking. Any heavier pressure than this is liable to cause undue brush wear and commutator wear. Very often you will find on a four pole machine that the top brush is sparking badly while the other brushes seem to be okay. The cause of this is generally found not in any trouble with the top brush but the trouble is usually found in the bottom brush, the one that is hardest to get to see. The bottom brush gets all the overflow oil from the bearing and dirt and is usually the first one that sticks in the brush holder. Thereby, it does not follow the commutator so that eventually the top brush has to carry double current. The brushes should be taken out periodically, washed off, cleaned in gasoline, and dried, the brush holder cleaned out and the brushes put back carefully in the same position from which they were taken.

"At all times all brushes should make contact across the whole face of the brush and therefore when putting in new brushes these should be sanded in to accomplish this 100 per cent contact.

Commutators

"A good commutator should be dark chocolate color with a highly polished surface. This means long commutator life and low brush maintenance. The commutator should not be continually sanded in order to keep the bright finish. It should only be wiped off, using a dry rag and occasionally a little touch of paraffin. If the commutator shows evidence of cutting then the brushes are too hard and softer and more lubricant brushes should be used. All commutators now are usually undercut, that is the mica taken out between the commutator bars. This space where the mica is taken out between the commutator bars should be kept free from carbon dust, otherwise you are going to short some of the turns in the armature and cause a burn-out in the armature coils.

"On large D.C. machines we usually have connected back of the commutator risers what are known as equalizers which are copper straps or copper wire that connects from the commutator risers on one pole to the same position of the commutator riser of the same polarity in order to equalize the current in the armature, which may be caused by commercial manufacturing, non-equalized air gaps or magnetized circuit or so forth. These connections of the equalizers to the commutator risers should be carefully inspected to see they are in good operating condition. Also equalizers should be carefully inspected to see they have not become shorted upon themselves back of the commutator risers."

New Questions

Relative Humidity Problem

Question No. 835: We have a refrigerated storage room 80 by 48 by 11ft. high with 4 in. corkboard insulation all around and a single 4 by 6 ft. 6 in. door. The room is refrigerated by ceiling coils of 2 in. pipe 2000 ft. long with drip pans underneath. Brine at 15 to 18 F. is circulated through the coils to maintain the room at 35 to 38 F.

Stored in the room are nuts, dried fruits, popcorn and similar items. It is desired to hold the relative humidity in the room at about 50 per cent but it usually runs up around 90 per cent. What is wrong at present and how can the room be made to hold the desired relative humidity?—C.C.P.

Pressure from Liquid Expansion

Question No. 836: A closed steel shell of 18 inch diameter and 60 inches long is filled with water at 68 F. and 30 lb. gage pressure. What will the pressure rise to if the temperature of the water is increased to 203 F.?—J.W.B.

Beam and Column Insulation

Question No. 837: Where steel beams of columns project from a cold room through the insulation it is customary to insulate these beams for some distance out into the room. Is there any specific guide to follow in the extent of this insulation? For example in a room held at -5F. the insulation on the walls is 6 in. thick. A 12 in. I beam extends through the insulation into the brick wall behind it. What thickness of insulation should be supplied to the I beam and how far out should it extend?—L.P.C.

A Letter From the President

TO THE MEMBERSHIP:

THE 40th annual convention at Purdue November 8th to 11th has been acclaimed the outstanding educational program by delegates and members fortunate enough to attend. The speakers and the subjects presented covered every field of the refrigeration industry represented by our group. To those who could not attend, the papers will be published in ICE AND REFRIGERATION and the 1950 Operating Data Book. Delegates attending have expressed a desire to apply the Purdue standard to all our National Conventions.

The N.A.P.R.E. is purely an educational association and too much stress cannot be placed on the quality of the educational work. Locally and nationally refrigeration classes presented by members of the organization who have the practical knowledge have proven successful.

The entire tradition of the N.A.P.R.E. has been one of "Self-Help" through cooperation. The meetings should have discussion periods for those who have a problem. The 1950 Board of Directors are planning a bulletin to assist you in conducting interesting chapter meetings.

Chapter secretaries can assist the National secretary's office by encouraging a prompt payment of dues and handling all correspondence with the National secretary in a prompt manner.

Secretary Brandt and Erich Utescher, Chairman of the Operating Data Book Committee have already begun the work of securing advertising for the 1950 book. They will look forward to receiving the cooperation of the officers and members in this important work.

Our educational program is the fundamental basis of our organization and is financed through the advertisements in the Data Books. Your Data Book is patronized by all progressive industries who have chosen it as a medium to interest you in their products. Use it as you would a catalogue and have it available at all times. Few of us realize the coverage of this book which reaches all mem-

bers including our members at large who are located throughout the world.

Members at large and chapters should support your Membership Committee. New ideas will be presented this year which will give the individual as well as the chapter recognition. I can advise the few chapters who have won the contest for years to look to Seattle for competition this year.

I am looking forward to a successful year which can be achieved through cooperation of the National officers, Committeemen, Members at Large and Chapter Members.

E. T. QUINN
President N.A.P.R.E.

Member Activities

Seattle

By J. D. HENION

THE special lectures on the use of the Mollier chart in plant operation have been continued by O. F. Gellert. The early discussion in the series described the make-up of the chart and explained the data which can be obtained from it. Then Mr. Gellert proceeded to numerous demonstrations of the chart in the solving of practical plant problems. He showed how the chart is used to check refrigerating effect under various conditions and how it is used to determine theoretical discharge temperature of the refrigerant.

President Giel appointed Gil Hickok, Bob Rittenburg and Jim Henion as the nominating committee to select officer candidates and they presented their recommendations at the December meeting. The chapter approved the nominees and all of them were placed on the ballot for submission to chapter vote.

The new members welcomed by the chapter were Thomas McLane, Florence Walton and Zenas Dobbs.

Stockton-Modesto

By R. M. EDGER

The special speaker at the first meeting of the period was J. C. Mooney, Plant Asbestos Co., San Francisco who gave us a very interesting talk on cork insulation and pipe covering. He took us from the cork tree through the various processes of manufacture to the finished pipe covering. Then he discussed methods of application including the installation and wrapping of pipe covering and the methods of wall insulation which promote maximum life. Sketches were made to illustrate proper methods and suggestions were added to guide maintenance procedure. It proved to be a most interesting and helpful talk.

At the following meeting President Greenestreet presented his second lecture on the use of the Mollier diagram for ammonia. The make-up of the chart had been previously described so Mr. Greenestreet proceeded to show how the chart is used to check the operation of the system and guide the engineer in his work.

Dallas

By D. F. BANCOOK, SR.

At the first meeting of the month Warren Cunningham gave a report on the Purdue Convention and told about the features of the educational program, as well as the business transacted by the association. After a short business session the meeting adjourned and the members met at the Stoneleigh Court to hear a lecture on automatic controls.

We were sorry to learn at the second meeting of the month that one of our charter members, N. R. Glasgow had passed away. Mr. Glasgow was engineer with The Borden Co. in Dallas for several years.

The special subject at this meeting was solenoid valves and our Educational Director led in a discussion of their proper application, as well as methods used to avoid defective operation and failure. The proper way to install ammonia valves was outlined by J. Ed Lawrence and was well received.

Los Angeles

By FRED HERR

Dale Rycraft, Jr., of the Peterson Manufacturing Co., was unanimously elected to the post of 1950 president of Los Angeles Chapter.

Dale Rycraft

The slate of officers reflects several major changes in the lineup of men that guided chapter affairs in 1949. George Paulick, executive secretary for the past several years, surrenders that post to succeed Elmer Johnson as class instructor, who felt obliged by the burden of other affairs to step down from a position which he had handled with outstanding success for a number of years. For 1950 secretary the chapter chose Donald H. Byl, a past-president.

Received with elation by the chapter was the news that Emmett Quinn had consented again to accept the post of chapter treasurer, an office he will fill in addition to his duties as the new national president of the association.

The complete slate of officers and major committee chairmen is as follows: Rycraft, president; first vice-president, George Paulick of the California Consumers Corp.; second vice president, R. L. Maple, Union Ice Co.; secretary, Mr. Byl; treasurer, Mr. Quinn; sergeant-at-arms, Joseph H. Granger, City Ice Co., the incumbent in that post.

Board of Directors, Clifford C. Nordholm, chairman; Michael Julius, C. P. Scott, Elmer Johnson and Walter W. Perry.

Advisory Board: Rudi C. Kettler, chairman; Donald H. Byl and Ralph Moore. Class instructor, George Paulick.

Committee chairmen: Educational, Regis Gubser; Entertainment, Frank Elliot; Finance, William Losch; Membership, William R. Burnett; Attendance, John Anthoney; Employment, Frank Eccleston.

The nominating committee played a sort of diabolical trick on Burnett. At a recent meeting he had declared that, with the chapter serving as host to the national convention in 1950, a special effort should be made in the membership campaign to bring chapter membership up to 500, by acquiring 175 new members. If previous procedure had been followed, Frank Elliot would have been chairman of the 1950 membership committee, and would have been faced with the job. However, the nominating committee seemed to think that a man enthusiastic enough to talk about 175 new members when the chapter already is the largest in the NAPRE, should not be deprived of the privilege of personally conducting the campaign. The chapter gave him the job.

No evidence that Los Angeles Chapter intends to "ease up" on its competitors during the 1950 drive (New Orleans, please note!) was contained in President Rudi Kettler's remark as the 1949 membership pennant was hung on the wall beside the banners for 1948 and 1947. "There's still plenty of room on that wall, fellows," he said.

The membership was fully cognizant of that fact that a "mighty good man," as Chairman Burnett of the nominating committee phrased it, was needed as chapter president for 1950. This year many important decisions and much work in connection with the preparation for the national NAPRE convention in Los Angeles will devolve upon the chapter president. In Dale Rycraft the chapter believes it has the right man for the job.

The membership took a justifiable pride in the election of Emmett T. Quinn as national president at the Purdue convention, Regis Gubser, prefaced his report of the convention by explaining that Quinn, while enroute to the convention, was removed by doctor's orders from the train at Albuquerque, N. M., and returned to Los Angeles for treatment for an attack of food poisoning. The many friends of the new national president will be glad to learn that Mr. Quinn has made a complete recovery and that on December 7 he was back at his desk in the Pacific Fruit Express office, wading through a ton or so of accumulated mail and plant reports.

Elmer Johnson's retirement from the post of class instructor by declining to accept reappointment for 1950 was received with considerable regret. He was publicly com-

mended by President Kettler for the splendid work he had done in that position and the membership accorded him the honor of a spontaneous rising vote of thanks.

Upon motion of Regis Gubser, seconded by Frank Elliot, the chapter voted to increase the 1950 local dues from $7.00 to $8.00. The increase was made effective for 1950 only, with the amount of chapter dues for 1951 to be redetermined next December.

Frank Eccleston, chairman of the employment committee, reported a rising trend in unemployment in the industry in Southern California. He suggested that the secretary circularize refrigeration plant and ice company operators in an effort to locate job openings.

An honorary membership in the chapter was voted to J. M. "Jake" Ridinger of Los Angeles, retired, formerly engineer for the Arden Dairy Farms Co., who has been an NAPRE stalwart since the early 1920's. The recommendation to award honorary membership to Mr. Ridinger was made by Capt. Herbert N. Royden of the City Ice Co., and was unanimously approved.

San Francisco

By N. O. Tice

The preliminary classes on refrigeration have continued with lectures by Instructor Stan Peterson. The special speaker at the first meeting of the month was R. B. Holland, western division representative Kramer-Treton Co., who discussed low temperature defrosting systems. A number of slides were used to illustrate Mr. Hollands's discussion. He analyzed the basic types of systems used to defrost low temperature pipe and coils and gave a complete description of the thermo bank which automatically removes frost from the low temperature surfaces. An interesting addition to the discussion was a demonstration unit in which the operation could be checked.

At the following meeting Orman New and Bert McKenna who attended the national convention made their reports. They described the many features of the educational program and told about the business transacted at the convention.

Chicago

By E. B. Jones

The refrigeration course on design and operation of automatic plants by Instructor Eugene Rytlewski has recently concerned itself with methods of checking operation. This was followed by cleaning and adjustment of the system. He gave examples to show how some systems are neglected and told about one which ran for 9 years without proper cleaning of the condensers with consequent increase in head pressure and power consumption. Among the other items frequently neglected are oil removal, treatment of condenser water and bleeding of the condenser water to reduce mineral concentration.

At the first meeting of the period the special lecture was presented by Stanley Erickson, Minneapolis-Honeywell Regulator Co. Mr. Erickson discussed electric and pneumatic controls for refrigeration plants. He described the application of the different types of controls and told which are most suitable for specific duty in various parts of the plant. Blue prints and catalogs were passed out to those in attendance and numerous questions from the audience were answered by Mr. Erickson.

A new Question Box Contest was announced by Les Clifford. Attendants at the meetings will be polled for questions on plant operation and operating principles. The questions will be rated by judges and those who submit the best questions will be presented with valuable prizes at the end of the year.

A symposium on compressor starting unloaders and capacity controls featured the second meeting. Participants were: C. R. Nicklas, Midwest Engineering & Equipment Co., Don Parkhurst, Burge Ice Machine Co., and William Laut, Westerlin & Campbell Co. The moderator was Emerson Brandt who discussed several of the questions in connection with unloaders and controls. Mr. Laut described equipment which unloads two cylinders with a valve which allows the gas to pass back and forth between them. Mr. Nicklas described the use of a solenoid operated by-pass for unloading to start the compressor and a system which holds suction valves open to provide capacity control.

On many jobs, Mr. Parkhurst declared that requests are made for needlessly complicated steps in capacity reduction. He cataloged the standard methods of capacity control as: by-pass control, clearance pockets, motor speed control, butterfly valve or evaporator pressure regulator. He presented figures to show the power consumption of various size motors at full and half speed and pointed out that these offer the best method for capacity reduction. The meeting was concluded with a number of questions which various members of the panel answered.

Rio Grande Valley

By Armin Doneis

Due to the unusually heavy schedule of Instructor John Muller and his increasing responsibility with Central Power & Light Co., it was decided to reduce his chapter work by drafting other qualified members to present various phases of the refrigerating course to the chapter. In accordance with this plan M. L. Kite led the discussion on compressors, their operation and maintenance. He brought the members much useful information on the finer points concerning ammonia compressors.

A very interesting report on the 40th national convention at Purdue University was presented by A. M. Casberg. He described the university town of Lafayette and the university buildings including the shops, laboratories and the huge Memorial Union building which housed the convention. Then Mr. Casberg gave highlights of the fine educational program and reported on the business the national association transacted at the convention.

In the Question Box section several interesting questions have been discussed. One of these was concerned with corrosion of condenser tubes in contact with rubber gaskets while another presented a problem in connection with corrosion of an underground pipe line. The latter suggested a subject for a special lecture in the future and steps are being taken to secure a competent speaker.

A. M. Casberg undertook to guide the discussion on ammonia condensers, their design, operation and maintenance. He briefly described the different types of condensers and then went into considerable detail regarding their relative merits and disadvantages as regarded efficiency, ease of operation, purging, and maintenance and space requirements. Mr. Casberg made the evening very profitable by his contribution to this series of discussions. Many members went away with new ideas and better concepts of what made a good condenser installation, and what types were most suitable for various locations and water supplies.

Colton

By H. O. Bonter

The special speaker at the first meeting was L. C. Clark, chief electrician Colton Cement Plant. He presented a very interesting address about his company's program of reconstructing and expanding its electric distribution system at a cost of about 250,000 dollars. Among other things Mr. Clark pointed out the phenomenal growth of the plant which began operations with a connected load of about 500 h.p. and has expanded to the present connected load of 25,000 h.p.

On the blackboard Mr. Clark outlined the general arrangement of the new distribution system and compared as he went along with the old obsolete equipment removed from the plant. Included in the highlights Mr. Clark discussed were the recent changes involved in converting the electric system from 50 to 60 cycle operation.

News came at the following meeting that Mrs. A. W. Franklin had been injured in an automobile accident and the chapter voted to send a letter to Mrs. Franklin wishing her a speedy recovery.

A report was made by E. H. Carlson of his trip to the Santa Fe Ice Plant at Bakersfield to inspect a new car icing machine they have in operation. He gave detail sketches and description of the machine which travels on rails on deck and is supplied with ice by the deck conveyor. The machine picks up the ice and sends it through a crusher from which it passes through chutes into the car bunker. One man riding on top of the machine has full control of it and the ice supplied by the deck chain. A communicating system permits the operator to talk to the men in the storeroom who are feeding ice to the conveyor system and also to communicate with the office for orders.

Memphis

By Charles Conley

The special subject presented at the first meeting of the period was concerned with heat insulation. Chris H. Fiedler and W. S. Strehl, Jr. of the Chris Fiedler Co., discussed those phases of the subject which are most interesting to engineers. The company distributes Mundet Cork Co. board and pipe covering and does a general business in all types of insulation application and roof work. In his discussion Mr. Fiedler emphasized the fact that enduring service from insulation depends a great deal on the method of application and workmanship, as well as the materials used in the erection.

The chapter delegates to the national convention at Purdue were Alvis Clay, Herbert Davis and Charles Conley. They reported on the interesting phases of their trip and the educational program at the convention. In connection with the convention trip Mr. Conley visited friends in Chicago and Pittsburgh, as well as the central plant of the York Corporation at York, Pa.

Through the courtesy of R. J. Johnston, supervising foreman of the Southern Bell Telephone & Telegraph Co., an inspection tour was made through their recently completed main telephone exchange where the group was shown the equipment which serves a large city with efficient local and long distance telephone service. The group was shown how the automatic dial phone system works and how the telephone calls are handled in the manual system. This inspection trip was made possible through the cooperation of John Thrithart, General Electric Co.

At the following meeting A. W. Shelby, Shelby-Skipwith Co., talked on packaged refrigeration and air conditioning. He stressed the hermetically sealed units for automatic equipment and described the great strides that had been made in this type of system. Blown up diagrams were used to illustrate the operating principles and design. Then Mr. Shelby described the different types of cube ice machines now on the market. His company sells a well known type of ice cube machine and he stated that more than 500 are in use in Memphis while more than one thousand machines are in use in the territory covered by his company.

Echoes From the Convention

THE 1949 Convention is past, but its memories will linger long into the future. So many complimentary expressions were made about the program, the speakers, and the environment at Purdue that I am sure the members will hanker to come again. The door is always open and Purdue extends a standing invitation to come whenever you elect.

Mrs. Venemann and I wish to thank the delegates and their ladies for the many nice things they said about our part in the program. You have made us very happy.

H. G. Venemann.

Hubert Branham, Sergeant-at-Arms

AT the 40th Annual Convention, Hubert Branham, Pocatello, Idaho, was elected Sergeant-at-Arms. Through an error his name was omitted from the list of national officers in the December issue.

Mr. Branham who has long been a member of NAPRE and a regular attendant at national conventions is employed by the Pacific Fruit Express Co.

Harry T. Whyte Improved

FOR a number of months Harry T. Whyte, past national president has been in a convalescent hospital near San Francisco. It is reported that recently his health has improved and he has expressed appreciation of the letters sent to him by his friends. His present address is Grant Road, Route 2, Box 312, Mountain View, California.

New Orleans

By F. X. Gillio

An outstanding educational program was presented to the chapter in the meeting at the St. Charles Hotel through the cooperation of the Allan J. Harris Co. The principal speaker was Dan Allshouse, Northern Equipment Co., Erie, Pa. With the aid of slides he presented an informative lecture on boiler feed water regulation which traced the development from its infancy in 1895 to the present time and explained in detail the operation, maintenance and design of the system. Assisting Mr. Allshouse in answering questions from the floor was a panel of engineers from various local industries: F. R. Mendow, A. M. Lockett & Co., Mallard Seago, New Orleans Public Service Co., and C. V. Watson, Henderson Sugar Refining, Inc., a member of the chapter. The questions submitted were read by Chairman Vivien of the Educational Committee and were ably answered by the panel of engineers and Mr. Allshouse. We are deeply indebted to him since he made a special trip from the factory to deliver this address.

A special course in air conditioning is being presented by A. O. Festorazzi, construction engineer and R. Styer, sales manager, Airtemp Construction Corp., who have had long experience in the design, operation and servicing of air conditioning systems. The two instructors at their first session explained in detail the operation, maintenance and servicing of the compact or packaged type units which have gained such popularity in the field. Cut-away sketches of the compressor, condenser, receiver, expansion valves, cooling coils and other parts were shown. Considerable interest was evident from the questions asked and ably answered by both speakers. As the course progresses, considerable interest is being created, important information is being imparted to the members and the attendance is increasing.

Convenient Way to Strengthen Brine

IN THE past we have had considerable trouble in strengthening the brine (Sodium Chloride) in our freezing tank. It becomes weaker as fresh water, in refilling after cores are pulled or otherwise, is introduced into the tank. Formerly we suspended a small tank, with a rad through holes near the top, and put a few pounds of salt in the bottom. This mixing tank was suspended where we had taken out one of our regular cans, so we ran a hose in it and stirred vigorously as the tank overflowed into the brine tank. It was very difficult to increase the specific gravity to any appreciable extent in this way, furthermore there was danger of getting too much brine.

Now we pull two cans and put a 2 by 4 across the opening. Next we run small ropes or heavy wire through the tops of the regular burlap bags containing the salt and suspend them in the brine. With moderate circulation by the agitator it is surprising how quickly the salt will dissolve, even in brine as low as 15 F. It is no trouble at all for the man on shift to add a thousand pounds or so whenever a test shows it is needed. Bags must be firmly secured, of course, so they cannot get loose and into the agitator.—Harold Sykes, Flagstaff, Ariz.

Refrigerator Sales in Canada

AN increase in Dominion sales of mechanical refrigerators, was reported at the directors' meeting of the Canadian Association of Ice Industries. Sales for 1949 are estimated at more than 150,000 over the entire 12 months, compared with 60,000 in 1940.

But ice refrigerators also are increasing in popularity, vastly improved from earlier models. N. A. Fairhead of Toronto said that in the last 10 years there has been a 250 per cent increase in over-all ice refrigerator sales in the Toronto area.

The 45th Annual Meeting, American Society of Refrigerating Engineers

THE American Society of Refrigerating Engineers held its 45th annual meeting in Chicago on December 4-7 with headquarters at the Edgewater Beach Hotel. The program featured a broad group of papers and discussions on refrigeration and allied subjects. The business of the association was conducted, the results of the annual election were announced and the new officers installed.

Numerous papers and conferences dealt with the problems and methods of equipment manufacturers. Applications of refrigeration to industrial production and to various operations in the food industry presented interesting information to the attendants. In addition two new standards were adopted by the membership and progress reports were given on the continuing work in this field.

A report on the large minus 85 degree refrigeration plant at Kodak Park showed how low temperature refrigeration can be utilized to improve manufacturing processes and cut costs in film manufacture. J. H. Shaw, Eastman Kodak Co., told how use of this low temperature speeds production of film and effects better results in solvent recovery. Despite the low temperature employed, a secondary refrigerant is used as a chilling medium. Mr. Shaw described investigation of the properties of metals which determined make-up of the system and detailed ingenious methods employed in construction. The original operation of the system has proved quite satisfactory and it is expected that capacity will be mutliplied several fold through further additions of low-temperature equipment.

Food Applications

An ultra high voltage cathode ray installation at the Massachusetts Institute of Technology has been available for use in food research although its principal work has been in medical investigation. Professor Bernard Proctor of M.I.T. presented a paper describing the use of this equipment in the investigation of refrigeration and handling of haddock. The cathode ray tube can inactivate and kill micro-organisms in food without increasing its temperature or altering its properties. At higher rates of irradiation the enzymes in the food could also be inactivated but the lower rates were employed in the investigation on haddock to evaluate the action of the enzymes. The investigation showed that their action is negligible and that storage temperature is the most important factor. The effects of different storage temperatures were studied along with practices of the fishing industry. It was concluded that the whole haddock keeps much better in ice than eviscerated fish. Investigation indicates the possibility and the desirability of bringing the catch to shore in the round. Then it will be possible to recover a number of valuable by-products as well as supply better fish to consumers.

Wider use of partially dehydrated and frozen foods was suggested in a paper presented by R. R. Legault, United States Department of Agriculture, Albany, Calif. According to numerous tests he reported, the dehydrofreezing process produces vegetables and fruits quite comparable with the commercial frozen products. The advantages claimed through use of the process are a large reduction in weight and a very important reduction in volume which would decrease transportation and distribution costs. Furthermore Mr. Lagault said that much less costly packaging could be utilized with these products since much of the moisture which ordinarily requires higher priced packages has been removed. Defrosting problems for instance on fruits in commercial establishments were also reduced according to the author when this process of food preservation is employed.

Better methods of applying refrigeration on the fishing boats promises to reduce bacterial contamination and to improve the quality of shrimp. The details of the progress in this field were presented in a paper given by E. A. Fieger, Louisiana State University, Baton Rouge, La. The speaker also described investigation of storage methods with emphasis on the temperature levels required for proper holding of frozen shrimp. He emphasized that the best quality could only be attained by holding frozen shrimp at zero F. or lower.

Water Conference

The scheduling of a conference on water supplies and their conservation proved to be timely because of the national publicity given the plight of New York City in connection with a critical scarcity of water. The present situation in regard to water supply was thoroughly analyzed by E. L. Bean, City of Philadelphia Water Department, who stated that the deficiency all over the country results from expanding consumption beyond the capacity of present municipal facilities and the usage of ground water supplies above the rate at which they are replenished by nature. Mr. Bean briefly traced the typical development of municipal water service over a period of years and pointed out that the present per capita investment for water service is only $48 as a national average. This is too low to satisfy the increased demand during the past ten years, yet the cost to expand water supplies has increased so greatly that much higher rates would have to be applied if the previous pattern of consumption and expansion to meet it were followed.

One of the most rapidly increasing consumers of water is air conditioning installations. Unlike general industrial consumers, Mr. Bean said, the large proportion of air conditioning users is concentrated in the central, congested portions of the cities. There water mains are loaded and sewage systems also are operating practically at capacity. Yet it would be very costly to apply any significant additions to the systems. The characteristics of the air conditioning load are also a problem because there are peaks of demand which coincide with the general peak on water and sewage systems. Figures were given to show how these demands have built up during recent years on the Philadelphia water system. Conservation is the only solution to this problem and data was presented to show how some cities have already placed restrictions on water usage as well as the use of the sewage system to discard water secured independently from ground water supplies.

Conservation of Water

In the direction of water conservation H. E. Degler, Marlo Co., Kansas City, Mo., gave information on cooling tower selection for refrigeration and air conditioning. The conference was concluded with a paper on water quality control for refrigeration cooling towers by Ralph Westcott, Montgomery & Pomeroy, Pasadena, Calif. Other conferences dealt with the application of plastics to domestic refrigerators and room air conditioners.

Manufacturing and Testing

Two papers of special interest to refrigeration machinery manufacturers dealt with moisture determination in refrigerants and systems. T. W. Duncan, Seeger Refrigerating Co., Evansville, Ind., described a method of moisture determination in refrigeration units. W. A. Pennington, Carrier Corp., Syracuse, N. Y., discussed methods of refrigerant sampling with special emphasis on the difficulty of obtaining a sample of refrigerant having a moisture content typical of the entire refrigerant charge or supply.

Evaporative condenser performance factors were discussed in a paper by D. D. Wile, Refrigeration Engineering, Inc., Los Angeles, in which he described a unit to provide the condenser under test with a controlled supply of refrigerant gas. The refrigerant is free from oil and there is an easily controlled super heat arrangement. Essentially it is a refrigerant boiler operated by steam.

The Society has sponsored an investigation of heat transfer and pressure drop with turbulence promoters in refrigerant evaporator coils and a report was presented on this subject by R. L. Larsen, Case Institute of Technology, Cleveland, Ohio, where the investigation has been carried on. The effect of Freons on gaskets and seals of elastic composition was discussed in a paper presented by B. J. Eiseman, Jr., of Kinectic Chemicals, Inc., Wilmington, Del.

The problems of work in the last 100 degrees of the absolute temperature scale were presented by Alexander Goetz, California Institute of Technology, Los Angeles. Many interesting phenomena occur in this low temperature range as described by the speaker. For instance liquid helium climbs in and out of test tubes and other vessels so that special apparatus must be utilized to confine it. Also because molecular activity has practically ceased, heat leakage ceases to be a problem but desirable conductivity of heat is difficult to establish and carry on.

The Hilsch vortex tube which is a small cyclone type air jet that simultaneously discharges cold air out of one outlet and warm air out of the other was analyzed by B. S. Webster, E. I. du pont de Nemours & Co., Inc., Wilmington, Del. Some military aspects of portable refrigeration equipment were discussed by Sterling Smith, Sterling Refrigeration Products, Washington, D. C.

Standards

The Society formally adopted two standards: Methods of Rating and Testing Refrigerant Compressors, 23—R," and Methods of Rating and Testing Air Conditioners, 16—R." The progress report on the work of the Standards Committee for desiccants was presented by Walter O. Walker, Ansul Chemical Co., Marinette, Wis., who is chairman of that committee. He described the numerous problems which the committee has faced in this work. The requirements of a good desiccant were listed and it was reported that the methods of testing have been set up. Other problems remain to be solved but the committee expects good progress in the work during the coming months.

At the final session of the convention, the results of the election conducted by mail ballot were announced and the new officers were installed as follows:

President, John G. Bergdoll, Jr., York, Pa.

Vice-president, Paul B. Christensen, New York, N. Y.

Vice-president, Edward Simons, San Francisco.

Treasurer, Richard Jordan, Minneapolis.

Directors: Frank H. Faust, Bloomfield, N. J.; Arthur J. Hess, Los Angeles, George Iwashita, Bloomfield, N. J.; Rowland Lock, Toronto, Canada; Herman Spoehrer, St. Louis.

The 1950 spring meeting of the Society will be held in Kansas City, Mo., according to an announcement made at the meeting.

California Refrigeration Societies Hold Joint Meeting

THE second annual joint meeting of Southern California Council of Refrigeration Societies was held on the night of November 16 in Rodger Young Auditorium, Los Angeles, with approximately 200 members from the six refrigeration groups which comprise the council in attendance.

The idea of holding a joint session of all refrigeration organizations in the Los Angeles area was initiated a year ago through the efforts of Neal S. Templin, managing director of the Refrigeration Contractors Association. The first joint meeting proved so valuable in providing a central medium for joint expression of ideas and discussion of industry problems, that it was repeated this year.

Member societies which jointly sponsored the dinner meeting on November 16 were the following: American Society of Heating & Ventilating Engineers; American Society of Refrigerating Engineers; National Association of Practical Refrigerating Engineers; Refrigeration Contractors Association; Refrigeration Maintenance Association of Southern California; and Refrigeration Service Engineers Society.

The program consisted of a social hour at 6:00 p.m., dinner at 7:00 p.m. and business meeting at 8:00 p.m. George Weston, president of the Southern California ASRE Chapter, and president of the Council, presided.

The principal speaker was R. J. Thompson, director of sales, Kinetic Chemicals, Inc., Wilmington, Del., who is credited with the introduction, development and engineering adaptation of the Freon family of refrigerants, as well as being instrumental in securing their acceptance by the industry and public. The subject of his talk was "Freon, A Modern Chemical Achievement."

Institute of Food Technologists

THE Chicago Section of the Institute of Food Technologists will be hosts to the National Society for the IFT Decennial Conference to be held May 21-25, 1950, at the Edgewater Beach Hotel. The first annual conference was held in Chicago in 1940 when IFT had a membership of about 700 food technologists and has since grown in size to approximately 3,000 members.

In view of the growing influence of food technologists in the continuing development of food and allied industries, it is planned to extend invitations to outstanding leaders in finance and industry for a special luncheon to be followed by a timely address by an international banker. The purpose for such a gathering is to create a broader appreciation of the significant roles food technologists have already assumed and are prepared to extend in the future development of food industries and the national economy. As a means of emphasizing past and potential capabilities, no technical sessions will be held on Tuesday afternoon May 23 (following the luncheon for their business guests) in order to permit uninterrupted inspection and review of the exhibits by the invited executives, IFT members and guests.

Packaged Fish Producers

A LIST of firms preparing fish fillets, steaks, and other packaged fish has been issued by the Fish and Wildlife Service, Washington, D. C. to provide information on sources of supply of these products. Copies of the list "Producers of Packaged Fish" may be obtained free upon request by asking for MDL 1 from the Division of Information, Fish and Wildlife Service, Washington 25, D. C.

Frozen Foods
Reg. U. S. Patent Office
COVERING EVERY PHASE OF THE QUICK FREEZING OF PERISHABLE FOODS—PREPARATION, PACKAGING, FREEZING, STORAGE, DISTRIBUTION, DESIGN, CONSTRUCTION, EQUIPMENT, OPERATION OF LOCKER PLANTS.

Frozen Food Industry Convention Provides Comprehensive Program

ALL important aspects of frozen food production and distribution will be covered in the comprehensive program arranged for the 1950 Frozen Food Industry Convention, scheduled for the Congress Hotel in Chicago, January 31 through February 3. Under the Chairmanship of Wm. M. Walsh, president of the National Wholesale Frozen Food Distributors, Inc., the All-Industry Convention Committee is completing arrangements for a busy four day Convention period which will include panel discussions of major importance and interest to frozen food packers, brokers, distributors, and others having a stake in the frozen food industry.

Outstanding authorities will appear on one of the symposiums "Research and Standards, Present and Future," scheduled for Wednesday, February 1. Leaders in this important field of research and standards who will address the convention meeting are: Dr. J. L. Heid, director of research, Florida Citrus Canners Cooperative, Lake Wales, Fla.; Dr. H. C. Diehl, director Refrigeration Research Foundation; John H. MacVey, Counsel, and A. W. Dutcher, administrative assistant, research and standards, National Association of Frozen Food Packers, Washington, D. C. L. S. Martin, secretary-treasurer of the National Association of Frozen Food Packers, will preside.

Also on the officiail agenda are scheduled the regular annual business meetings of the National Association of Frozen Food Packers and the National Wholesale Frozen Food Distributors, Inc., directors' meetings, and meetings of committees working on problems in the fields of warehousing and transportation, legislation and research and standards.

Social events include an all-industry cocktail party, a luncheon, and a buffet supper, but major efforts are being given to developing the business features of the program—

(Continued on page 86)

Tentative Schedule of Events

TUESDAY, JANUARY 31

9:00 a.m. All-Industry Registration Opens
10:00 a.m. Board of Directors Meeting, National Wholesale Frozen Food Distributors, Inc.
10:00 a.m. Board of Directors Meeting, National Association of Frozen Food Packers.
2:00 p.m. Panel Round-Table—"Distributors Plant Facilities", National Wholesale Frozen Food Distributors Inc.
2:00 p.m. Legislative Committee Meeting, National Association of Frozen Food Packers
2:00 p.m. Warehousing and Transportation Committee Meeting, National Association of Frozen Food Packers.
6:00 p.m. All-Industry Cocktail Party, Casino Room.

WEDNESDAY, FEBRUARY 1

8:30 a.m. Brand Breakfasts, National Wholesale Frozen Food Distributors Inc.
10:00 a.m. Panel Round-Table — "Distribution Through Chain Stores", National Wholesale Frozen Food Distributors Inc.
10:00 a.m. Panel Round-Table — "Institutional Distribution", National Wholesale Frozen Food Distributors, Inc.
10:00 a.m. Symposium "Research and Standards—Present and Future", National Association Frozen Food Packers.
1. Role of Research in Introducing a New Product.
2. Industry's Place in Preparing Food Standards.
3. Current F&DA Activities.
4. University Research and the Frozen Food Industry.
2:00 p.m. Annual Meeting, National Wholesale Frozen Food Distributors, Inc. (Members Only)
2:00 p.m. Annual Meeting, National Association of Frozen Food Packers. (Members Only)
3:00 p.m. Panel Round-Table—"Distribution Costs", National Wholesale Frozen Food Distributors, Inc.

THURSDAY, FEBRUARY 2

10:00 a.m. Symposium "Production Techniques", N.A.F.F.P.
1. Integration of Field and Raw Product Schedules with Successful Production
2. Production and Material Control
3. Mechanics of Handling materials in Production and Storage
4. Line and Equipment Design
12:30 p.m. All-Industry Luncheon and General Session, Gold Room
7:00 p.m. All-Industry Buffet Supper, Casino Room

FRIDAY, FEBRUARY 3

10:00 a.m. Board of Directors Meeting, National Association of Frozen Food Packers
2:00 p.m. Board of Directors Meeting, National Wholesale Frozen Food Distributors, Inc.
4:30 p.m. All-Industry Committee Meeting

Open House Receptions at Chicago Distributors' Plants, National Wholesale Frozen Food Distributors, Inc.

"BUTCHER BOY" is the preferred cold storage door of the industry, because it has ALWAYS met every conceivable challenge of hard usage. The strong, massive construction of Butcher Boy doors is the result of "controlled quality" production — a guarantee that they will meet every rigid test of required performance.

Time tested heavy duty hardware applications, PLUS prime insulation, PLUS 100% Douglas Fir Construction is a resultant product equalled by none — BUTCHER BOY. Write for free bulletins today.

VESTIBULE-TYPE TRACK DOOR

BUTCHER BOY COLD STORAGE DOOR CO.

170 N. SANGAMON ST., CHICAGO 7, U. S. A.

assuring all delegates of an opportunity to learn about and discuss significant industry developments.

Meantime, the Convention Housing Committee reports that requests for room reservations are coming in fast, and all indications are for a big attendance. Industry members planning to attend are being urged to make their arrangements early, to avoid disappointment. Participating associations will be headquartered at the Congress Hotel, and business and social events will be at that hotel also.

Panel Discussions

Production techniques and research and standards will be the subjects of symposiums which will be conducted by well-known industry authorities. These will be an important part of the program being arranged for all segments of the industry.

Meantime, additional panel discussions on marketing, sales, and related problems also are being arranged, according to Wm. M. Walsh, President of the National Wholesale Frozen Food Distributors, Inc.

The panel discussions being sponsored by the National Frozen Food Packers will consist of short opening statements on various aspects of the subjects by the industry authorities, to be followed by group discussions. All in attendance will be encouraged to participate in the discussions, with plenty of opportunity for questions and observations.

The symposium on production techniques tentatively is scheduled to include such subjects as

(1) Integration of Field and Raw Product Schedules with Successful Production.

(2) Production and Material Control.

(3) Mechanics of Handling Materials in Production and Storage.

(4) Line and Equipment Design.

Subjects now expected to be included in the symposium on Research and Standards, Present and Future, are:

(1) Role of Research in Introducing a New Product.

(2) Industry's Place in Preparing Food Standards.

(3) University Research and the Frozen Food Industry.

(4) Current F & DA Activities.

Refrigerated Storage of Candy

(Continued from page 42)

by the laboratory taste panels at the Experiment Station, by the Research Committee of the National Confectioners' Association and by others in the candy industry whose long years of experience with peanut and pecan candies make them expert "taste-testers." The candy will be scored on appearance, color, aroma, texture and flavor.

The same "taste-testing process" will take place again after one month's storage of the candy at the Experiment Station at room temperature. The totals of these scores will constitute a means of evaluating the acceptability of the candies.

Seasonability of Candy

Some types of candy are virtually off the market in sections of the country with high temperatures and high humidities. Certain types of candy are extremely perishable during the warm months. The fairly recent innovation of the refrigerated display case has made possible a somewhat more level sales pattern for boxed chocolates and other chocolate coated items. However, this is only one small facet of the whole candy storage picture.

All branches of the confectionery industry are looking forward with great interest to the factual data to be revealed by the two refrigerated research projects now in progress in Georgia.

Commerce Department Appraises Frozen Orange Juice Prospects

THE United States Department of Commerce has made its first official appraisal of the outlook for the frozen orange juice concentrate business for both the near future and the long term, and has concluded that prospects are bright. After a survey of packers' plans in California and Florida, the Department's Food Division draws these conclusions:

Barring unforeseen developments, total U. S. production of canned single-strength and frozen concentrated orange juice in the 1949-50 season may be 50 per cent higher than any previous year. Florida will have 13 or 14 plants in operation, and California will have 5 to 8. About 90 per cent of working capacity will be in Florida. Actual output of frozen orange juice concentrate will be between 22 to 25 million gallons. This compares with production of less than 11 million gallons in the season just ended, which was, in itself, several times the 1947-48 output.

"The season just ahead may turn out to be a testing period, during which the capacity of the consumer market to absorb processed orange juice will be determined," the study suggests. The frozen juice market, it adds, "seems to have a made-to-order opportunity to consolidate its consumer acceptance gains to date and to strengthen its market position for future years. Most of its expansion will probably be at the expense of fresh fruit sales. The convenience of the frozen concentrate will be an important consideration to purchasers toward overcoming any adverse price differential that may obtain at the time."

The study adds that competition between canned and frozen orange juice will enter a keen stage in the coming season if respective pack forecasts materialize. During 1948-49, supplies of both canned and frozen orange juice were too small to meet consumer demand. Holders of canned juice capitalized on this situation to force a sharp price advance. Marketing organizations handling the frozen concentrate chose a more conservative price policy in the interest of long-range considerations.

"In future years," the study concludes, "frozen concentrated orange juice will almost certainly make substantial inroads on the canned juice market. While the latter product will probably continue to have price advantage, the spread is likely to be progressively diminished as large-scale production and distribution operations on the frozen juice are perfected, and it may be increasingly ignored through consumer taste preference."

Sales Promotion for Shrimp

A SALES promotion and advertising campaign for Southern Seas Shrimp has been launched by Wilbur-Ellis Company, major supplier of seafood from Latin American waters. Wilbur-Ellis reports that, despite a marked increase in production, the demand for fine Mexican shrimp continues to run ahead of supply. Restaurants account for much of the increased consumption.

In the last seven years, shipments of fresh frozen shrimp from the Gulf of Mexico have climbed from a few hundred pounds to more than 15 million pounds this season, according to Wilbur-Ellis Company. This tremendous increase in popularity is due to the large size of Southern Seas Shrimp, which counts as low as twelve to the pound, as well as to the delicious flavor of this seafood.

To accommodate this growing demand, Wilbur-Ellis plans to hold stocks in frozen storage between seasons. These stocks are now being accumulated from improved packing and freezing facilities at lower California ports.

SPECIFICATIONS ON ICE STATION

ALL AIRCRAFT ALUMINUM CONSTRUCTION: Outside structure, .051 aluminum; dead air space; .032 Aircraft aluminum; permanently secured Fibre glass insulation; inside structure, .051 Aircraft aluminum. Vapor sealed throughout.

REFRIGERATOR DOOR: .051 Aircraft aluminum construction well insulated with batts of Fibre glass.

REFRIGERATION: 1½ H. P. condensing unit with banks of vacuum cold plate evaporators (more effective than coils). Guaranteed to maintain below freezing temperature with outside temperatures of 100°.

COIN MECHANISM: Lever operated, positive delivery, rejects slugs; also returns money when machine is empty.

PAT. PENDING

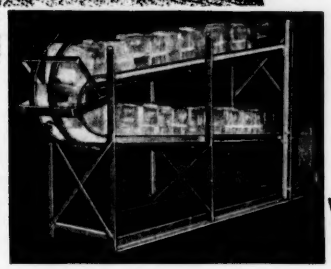
FRIGID-VEND AIRCRAFT ALUMINUM ICE STATION

Vends Blocked Cubed and Sized Ice

The Frigid-Vend Ice Station is in a class by itself because of its all Aircraft aluminum construction. Lighter in weight, it comes to you already assembled and mounted on skids ready to slide onto foundation.

Vending mechanism is positive and fool-proof. Vending lever is clutch operated, preventing breakage of handle and damage to mechanism. A customer, after insertion of money, can receive only one unit of ice at a time. Jackpot operation is impossible. Coin mechanism rejects slugs and returns money when machine is empty. In appearance, and in profitable operation, a complete Frigid-Vend Ice Station is all you could ask for.

The Station will vend four kinds of ice, two sizes of blocked ice as well as cubes or crushed ice in bags or packages. Or if you prefer you can vend any smaller combination of these four types.



GRAVITY ACTION DOUBLE DECK ICE BLOCK VENDORS

All steel construction with stainless steel covered tracks. ⅓ H. P. motor with gear head operates tripper bars during vending operation.

Capacity: 25 lb. ice blocks model—27 or 54 blocks
50 lb. ice blocks model—19 or 38 blocks

FRIGID-VEND BAG, PACKAGE AND ICE BLOCK VENDORS CAN BE PURCHASED SEPARATELY FOR INSTALLATION IN ANY ICE STORAGE ROOM.

Before You Buy, Get All the Facts. Write for information.
Prompt delivery on all Frigid-Vend Equipment.

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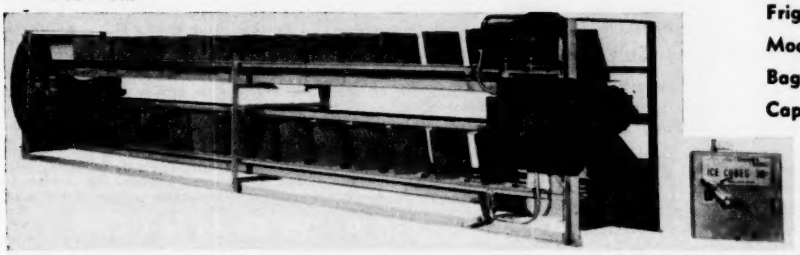
THERMO CUBER CO., INC. 2120-2124 N. SOUTHPORT AVE., CHICAGO 14, ILL.



Frigid Vend
Model 2-A-15
Bag Vendor
Capacity 32 bags

Refrigeration Storage Costs

(Continued from page 48)

would be on the basis outlined here where it is assumed all power is purchased.

Nothing could be more helpful in arriving at equitable power cost distribution than separate meters to give the consumption of each machine or even groups of similar machines. The plant in question is well equipped with meters as we can see by the readings taken from the engineer's log. Each of these is converted to its equivalent for a standard month by means of the conversion factors given in Part I. Since August has 31 days, each reading has been multiplied by 0.98118.

As a rough check, it is well to compare the power billed with the meter readings. Allowances must be made for the fact that the utility companies seldom bill on a calendar-month basis. It will be found, however, that quite accurate checks can be made if mental allowances are made for week-ends, holidays, etc. which might not be in both periods.

When metered consumption figures are not available, there is nothing to do but develop them by groups of machines as shown at the bottom of Form 6. From our inventory of electrical equipment we have the data from which to do this. We may have to resort to some juggling in order to arrive at figures which in total will compare favorably with the kwh consumption shown by the power bills, which, in turn may have to be modified to fit the period for which we are developing costs. An accountant will probably have to call on the engineering department for help in this matter, unless he has had some electrical engineering training.

The distribution of power used by compressors, exciters, etc. is made on the basis of the horsepower-hours in the various kinds of space—19.2 percent to the coolers, 70.1 percent to the freezers and 10.7 percent to the sharp freezers. Brine pump consumption must be calculated on the basis of the horsepower and hours of operation of the various pumps serving the different types of rooms. The other items, air circulating fans, elevators and lights must be similarly distributed. It should be noted that elevators are considered a handling expense and that the consumption for lights is distributed both to overhead and handling accounts.

When the kwh distribution is completed it is converted to dollars and cents by means of the cost per kwh shown in the upper right-hand corner of the form.

The final step in this form, which is a distribution voucher as well as a work sheet, is to recapitulate the various amounts opposite their various accounts as shown in the lower right-hand corner.

All the figures necessary for cost purposes have now been developed and it now remains to so arrange them that we can arrive at a cost per ton of refrigeration and the cost per square-foot of space in each kind of space. We will then be able to work up individual commodity storage costs. These final phases of the procedure will be covered in the next article of this series.

Frozen Food Men Move to Cut Costs

A PROPOSAL to create a joint committee to study methods of reducing costs of warehousing frozen foods has been approved by the National Association of Frozen Food Distributors.

The proposal was made by Paul Christianson, vice president of the Merchants Refrigerating Co., of New York., who said that such a committee, made up of members of the distributor's group and the National Association of Refrigerated Warehouses, should be formed as soon as possible.

The Refrigerated Storage of Green and Roasted Coffee

(Continued from page 34)

Tests of blends made from coffees held in cooler and dry storage, as listed below, also were made in connection with the Kansas City tests:

Blend No. 1
3 oz. C345 Dry storage
3 oz. B275 Dry Storage
3 oz. Santos Standard
(Lot No. 311)

Blend No. 2
3 oz. C345 Cooler refrigeration
3 oz. B275 Cooler refrigeration
3 oz. Santos Standard
(Lot No. 311)

Three drawings and cup tests were made on each of these two blends but the differences were so slight that they could not be determined by the coffee tasters.

No studies of the effects of refrigeration on roasted coffees were carried on at Kansas City.

Summary

The results of these exploratory tests are presented for the interest they may have for the members of the coffee trade and the warehousing industry. More precise and detailed investigations will be necessary to establish authentic storage conditions for the many types and grades of coffees. We feel, however, that the results of these studies have shown definite trends indicating that green coffees of high quality will benefit very greatly from storage in the temperature range of 32 to 35 F with a relative humidity of 60 to 65 per cent.

The present conditions in the coffee market probably will result in abnormally heavy purchases of green coffees by processers who must be assured of a dependable supply. Under the high prices prevailing it would appear that owners of reserves of high grade coffees would be interested in refrigeration to keep these coffees in prime condition. It is likely that many of the better Santos coffees also could be profitably stored under refrigeration.

Refrigeration of roasted coffees, especially when packed in paper bags, would appear to be worthy of trial under many conditions of merchandizing. The trend toward increased use of paper bags emphasizes the importance of this consideration.

Q.A.—New NARW Folder Informs Public On Refrigerated Warehousing Service

(Continued from page 41)

15—What is the difference between a locker plant and a refrigerated warehouse?

Locker plants usually serve individuals . . . provide small, private lockers . . . storage limited to small amounts. Warehouses serve commercial interests . . . store in large quantity . . . sometimes handle several million pounds a day.

16—How much of our perishable food supply is refrigerated sometime during the process of moving from farm to table?

Practically 100 per cent. Much of it provided by refrigerated warehouses.

This folder was prepared by the National Association of Refrigerated Warehouses as a special service to warehouse customers, schools, colleges, business organizations, clubs and the general public. It is an attempt to answer briefly and factually questions most asked about the refrigerated warehousing industry. If you would like more information or answers to questions not mentioned here, the Association will be glad to hear from you.

National Association of Refrigerated Warehouses
608 Tower Building, Washington 5, D. C.

Mundet district offices are located in these cities:

ATLANTA
339-41 Elizabeth Street, N.E.
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206 E. Stonewall St.
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2601 Cottage Grove Avenue
CINCINNATI 2
427 West 4th Street
DALLAS 1
601 Second Ave.
DETROIT 21
14401 Prairie Street
HOUSTON 1
Commerce and Palmer Streets
INDIANAPOLIS
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800 E. Bay St.
KANSAS CITY 7, MO.
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MUNDET

BOTH LOW AND HIGH TEMPERATURES

COMING CONVENTIONS

MISSOURI ICE MANUFACTURERS ASSOCIATION
January 9, 10, 11, 1950
Hotel President, Kansas City, Mo.
V. A. ESPHORST, Secretary-Treasurer

GEORGIA ICE MANUFACTURERS ASSOCIATION
January 18-19, 1950
Ansley Hotel, Atlanta, Ga.
WILLSHIRE RILEY, Secretary

SOUTHERN ICE EXCHANGE
January 18-19, 1950
Ansley Hotel, Atlanta, Ga.
WILLSHIRE RILEY, Secretary

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES
January 22-24, 1950
Mayo Hotel, Tulsa, Okla.
W. A. HADLEY, Secretary

VIRGINIA ICE MANUFACTURERS' ASSOCIATION
January 25-26, 1950
Monticello Hotel, Charlottesville, Va.
H. H. SNYDER, Secretary

AMERICAN WAREHOUSEMEN'S ASSOCIATION
January 30-February 2, 1950
Edgewater Beach Hotel, Chicago, Ill.
WILSON V. LITTLE, Secretary

NATIONAL ASS'N REFRIGERATED WAREHOUSES
January 30-February 2, 1950
Edgewater Beach Hotel, Chicago, Ill.
WM. DALTON, Executive Vice-president

NATIONAL ASSOCIATION FROZEN FOOD PACKERS
February 1-3, 1950
Congress Hotel, Chicago, Ill.
LAWRENCE S. MARTIN, Secretary

OHIO ASSOCIATION OF ICE INDUSTRIES
February 27-28, 1950
Deshler- Wallick Hotel, Columbus, Ohio
GUY W. JACOBS, Secretary

MICHIGAN ICE INDUSTRIES ASSOCIATION
March 2-3, 1950
Hotel Morton, Grand Rapids, Mich.
W. J. CAMPBELL, Secretary

NORTH CAROLINA ICE ASSOCIATION
March 6-7, 1950
Sir Walter Hotel, Raleigh, N. C.
LEWIS H. POWELL, Secy.-Treas.

INDIANA ASSOCIATION OF ICE INDUSTRIES
March 8-9, 1950
Lincoln Hotel, Indianapolis, Ind.
ROBT. W. WALTON, Secretary

EASTERN STATES ICE ASSOCIATION
April 12-14, 1950
Haddon Hall Hotel, Atlantic City, N. J.
SAMUEL FREER, Secretary

New Incorporation

Plainview, Tex.—Plainview Ice & Cold Storage Co., Inc., was granted 50-year charter of incorporation November 25, 1949. Incorporators were: Lucile H. English, High English and R. R. English. Authorized capital stock was listed at $10,000.

ASSOCIATION DIRECTORY

AMERICAN INSTITUTE OF REFRIGERATION
H. T. McDermott, Gen. Secretary, 433 N. Waller, Chicago 44, Ill.

NATIONAL ASSOCIATION OF ICE INDUSTRIES
Mount Taylor, Secretary, 1706 L St., N. W., Washington 6, D. C.

NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES
Wm. Dalton, Exec. Vice-Pres., Tower Bldg., Washington 5, D. C.

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OHIO ASSOCIATION OF ICE INDUSTRIES
Guy W. Jacobs, Secretary, The Steubenville Ice Co., Steubenville, Ohio

OKLAHOMA ASSOCIATION OF ICE INDUSTRIES
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461 Market St., San Francisco, Calif.

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Geo. L. English, Secretary, P. O. Box 603, Columbia, S. C.

SOUTHERN ICE EXCHANGE
Wilshire Riley, Secy.-Counsel, 421 Rhodes Building, Atlanta, Georgia

SOUTHWESTERN ICE MANUFACTURERS ASSO.
P. A. Weatherred, Secy. Counsel, Mercantile Bank Bldg., Dallas, Texas

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WEST VIRGINIA ASSOCIATION OF ICE INDUSTRIES
E. Dana Smith, Secy., Diamond Ice & Coal Co., Charleston, W. Va.

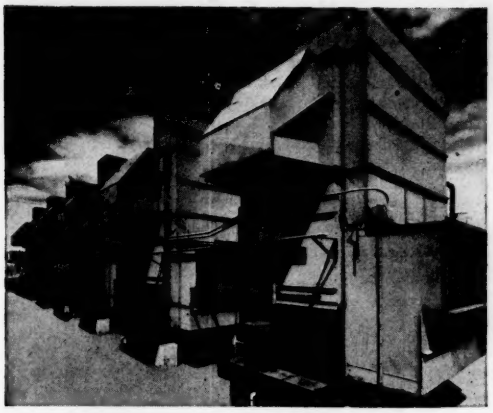
WISCONSIN ASSOCIATION OF ICE INDUSTRIES
Paul F. Hoff, Secretary, 1500 East Locust St., Milwaukee, Wis.

Sales and Reorganizations

Tecumseh, Nebr.—Herbert L. Hanson and Herbert B. Hanich of Stratton are now operating the ice plant and locker plant here. R. C. Gerhardt transferred ownership and operation of the Crystal Pure Ice Co. plant to them recently.

Portland, Ore.—Consolidation of plant and warehouse facilities of Hood Sales Co. in a building at 2112 N. W. Kearney St., has just been completed. Eventually, nearly all processes of the food company will be centered in the new location, Mr. Hood said.

Union City, Tenn.—Home Ice Co. and Citizens Ice & Coal Co. of this city were consolidated recently and will be operated under the new corporate name of Hi-Test Products Co. The new company will continue to operate the Home Ice Co. to produce ice and has started a $25,000 remodeling of the Citizens plant for continued handling of coal and fuel oil and the installation of grain grinding equipment.



Cut Costs TWO WAYS

By Modernizing Your Refrigeration With This New Condenser System

● Power savings and water savings combine to make money for you when you replace an old fashioned refrigerant condensing method with a modern Niagara AEROPASS Condenser. Either saving quickly returns the cost of the installation; both together make an important reduction in your operating costs for refrigeration.

In this new method the refrigerant gas passes through two cooling coils. The first coil, air-cooled, removes the superheat and condenses oil vapor from the refrigerant; the second condenses the refrigerant by the evaporation of a water spray from its surface. The heat is transferred to the air; less than 10% of the water used in conventional condensers is consumed and you save the cost of the water and the cost of its piping, pumping and disposal.

In addition the Niagara Aeropass Condenser controls the head pressure of your compressors at the lowest point for good operation, reducing your power bills. It does this automatically the year 'round, giving full capacity for peak summer loads and providing the greatest power saving in cold weather.

Hundreds of experiences in all industries that use refrigeration demonstrate these benefits and prove that they give a lasting improvement in refrigeration plant operation.

Write for Niagara Bulletin No. 103 for further information

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. IR 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

You don't have to shout for fast, prompt Ammonia service...

Just... write, wire or telephone your local Armour branch office. Immediate shipment will be made from the nearest plant. Armour's Anhydrous Ammonia is available in 50, 100 or 150 pound cylinders. It's pure and dry ...free of moisture and non-condensable gases. And, to insure trouble-free operations, every cylinder is tested and checked before shipping to give positive assurance of fine quality.

ARMOUR *Ammonia Division*

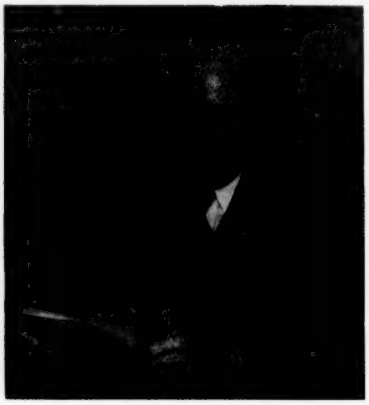
Armour and Company • 1355 West 31st Street • Chicago 9, Illinois

2501 83rd Street • North Bergen, New Jersey

OBITUARY

William M. O'Keefe

THE death of Wm. M. O'Keefe, for twenty-one years executive secretary of the National Association of Refrigerated Warehouses and well known among national refrigerated warehousing circles occurred Wednesday, December 7, in Washington, D. C., after a month-long illness. He was 59 years old. His loss will be keenly felt by his many friends and associates in the association and in the industry which he served faithfully for so many years.



William M. O'Keefe

Mr. O'Keefe was educat.d in Chicago parachial schools and Watson's Business College in that city. He began his business career with the Traffic Departments of the Erie and Illinois Central Railroads. Following employment by the Western Trunk Line Committee, he became executive secretary of the National Poultry, Butter and Egg Association and later vice-president and general manager of the Live Poultry and Dairy Traffic Association. June 1938 mark.d the start of his services as executive secretary of NARW, then known as the Cold Storage Division of the American Warehousemen's Association.

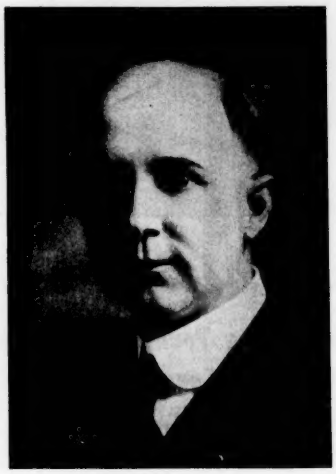
During the war he was granted a leave of absence from NARW to serve as Assistant Associate Director in the Storage Division of the Office of Defense Transportation in Washington, D. C. He held this position from November 1941 to July 1943, when NARW moved its offices from Chicago to Washington and he resumed his former duties as Executive Secretary.

In addition to his regular duties, he gave valuable service as secretary to the Association's Trade Practice Conference Committee, secretary to the Refrigerated Warehousing Code Authority during NRA and later assistant secretary of the OPA Refrigerated Warehousing Industry Advisory Committee to the U. S. Department of Agriculture.

Survivors include two sons, William M., Jr. and Richard F.; two brothers, Richard B. and John N.; and three sisters, Misses Katherine and Margaret O'Keefe and Mrs. Ellen Mullen.

Henry C. Capito

THE death of Henry C. Capito, president and manager of the Diamond Ice and Coal Co., Charleston, W. Va., occurred December 9 at his home after a short illness. He was 69 years old. Mr. Capito was a life-long resident of Charleston and was well known as a civic leader in his home town and also throughout ice industry circles in West Virginia and adjoining states.



Henry C. Capito

He attended Charleston schools and West Virginia University for three years and then took a position with the Diamond Ice & Coal Co. He was actively identified with this company throughout his business life and for several years had been president and manager. He took an active part in the West Virginia Association of Ice Industries and other local ice associations.

He was a Mason and a Shriner, and belonged to the Kanawha Lodge No. 20, Kanawha Commandery, Scottish Rites bodies and Beni Kedem Temple of the Shrine. He was also active in the Shrine band for a number of years. He was a member of the Charleston Rotary Club of which he was past president, a member of the board of directors of the Y. M. C. A., and for many years a member of the Charleston Chamber of Commerce. He was president of the congregation of St. Paul's Lutheran Church, and president and member of the board of directors.

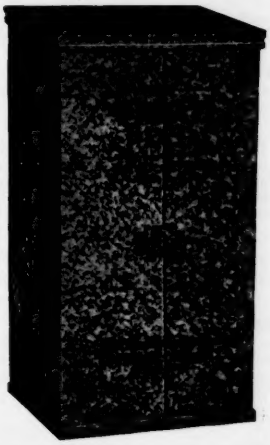
He is survived by his widow, Mrs. Pauline Capito and two sons John M. and Charles L., both of Charleston.

Carl A. Swanson

THE death of Carl A. Swanson, president of C. A. Swanson & Sons, refrigerated warehousing and poultry packers, Omaha, Nebr., occurred October 9 while attending a convention in Chicago. He was 70 years old.

Mr. Swanson was born on a farm in Sweden and came to the United States when a young man, later being employed by J. A. Jerpe, Omaha, Nebr., as a part-time bookkeeper. In 1900 he formed a partnership with Mr. Jerpe and Frank E. Ellison in establishment of the Jerpe Cold Storage Co. In 1928 his two partners retired and he became sole owner. In 1944 with his two sons, Gilbert and W. Clarke having become active assistants, the name of the company was changed to C. A. Swanson & Sons.

OHIO SPECIAL ICE CANS



Double Riveted
Welded
Integral Tube Cans
Arctic Pownall Cans
Can Baskets
Condenser Trough

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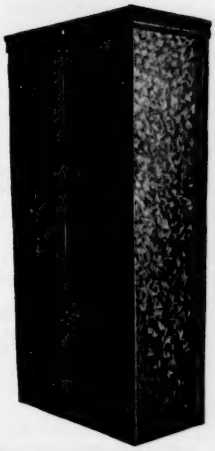
Industrial Trucks
and Trailers



THE OHIO GALVANIZING & MFG. CO.

NILES — *Established 1902* — OHIO

BOWER
- B B Brand AMMONIA

Est. 1858

Immediate shipment and purity of product are two good reasons for specifying Bower Brand. Please keep empty cylinder rotating.

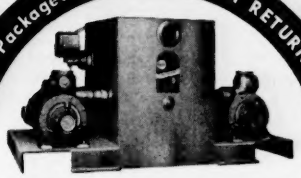
HENRY BOWER CHEMICAL MANUFACTURING COMPANY
29th & GRAY'S FERRY ROAD
PHILADELPHIA, PA.

They DEMANDED — "an equally superb, but smaller, unit."

FOR THE SMALLER JOBS

We AGREED — and HERE IT IS!

APCO Packaged CONDENSATION RETURN UNIT



Packaged Duplex Condensation Return Unit Equipped with No. 4 Series Apco Pump.

Sizes up to 15,000 rated sq. ft. equivalent direct radiation

For above capacities, write for BULLETIN 113-ST

Ideally suited for the automatic return to low pressure boilers of hot water condensation from radiators, coils, etc.,—and for return of water and other liquids to the overhead tanks of gravity circulating systems in industry. Being UTTERLY SIMPLE—HIGHLY EFFICIENT—REMARKABLY TROUBLE-FREE and LASTING, APCO PUMPS establish new high standards of performance.

For larger capacities, write for BULLETIN 113

AURORA CENTRIFUGAL PUMPS

A complete line, notable for streamline coordination between impellers and shells, including Single and Two Stage Horizontally Split Case, Side Suction, Vertical, Non Clog, Sump, Mixed Flow, Special Design, etc.

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS — AURORA PUMP COMPANY

Otto Hoeller

THE death of Otto Hoeller, manager of the Hoosier Ice & Coal Co., Michigan City, Ind. and past-president of Michigan City Rotary Club, occurred at his home Wednesday, November 23 following a long illness. He was 65 years old.

Mr. Hoeller was born in St. Louis and worked for several years as Public Relations Director of the Illinois Public Service Co. at Springfield, and later was a sales representative of the Ice Cooling Appliance Corp. In this connection he became well known to a large number of ice distributors throughout the middle west. He was a member of Acme Lodge No. 83 A. F. & A. M., a 32nd degree Mason, a member of the South Bend Consistory, Michigan City Lodge No. 432 B. P. O. Elks and the Rotary Club.

He is survived by his widow, Mrs. Ann Hoeller.

Maud Miller Coker

THE death of Mrs. Maud Miller Coker, secretary-treasurer and active head of the Home Ice Company of 1120 North La Brea Avenue, Los Angeles, occurred December 11 after a brief illness at her home at 2138 Veteran Avenue, West Los Angeles. She was 80 years old.

Mrs. Coker took over the management of the company after the death of her son, Harry P. Coker, Jr., who was president and general manager. She previously had managed an ice plant in Glendale. She belonged to a pioneer breed. Born in Junction City, Kan., she crossed the plains with her parents in a covered wagon when she was seven years old. Her husband, Harry P. Coker, who died in 1927, was a Los Angeles newspaperman. She has no direct descendants. Surviving is a sister, May Miller Hartsough; a nephew, a niece, and four distant relatives.

CHARLES E. BRAND, resident engineer of the Fairfield Ice & Coal Co., Fairfield, Ill., died December 12 from a heart attack while at work. He had suffered from a heart ailment for many months but his death was unexpected. He was 65 years old. Surviving are his widow, Mrs. Florence Brand, one son, Gene of Fairfield and four daughters.

H. W. WRIGHT, utility executive, died at his home in Calico Rock, Ark., December 9. Mr. Wright built the first electric power plant at Calico Rock in 1923. He also owned a similar plant at Marshall. Both of them were sold to the Arkansas Power & Light Co., earlier this year. He continued to operate ice plants in both cities.

FREDERICK A. SIEGEL, 84, founder of the Wayne Ice Co., Erie, Pa., died November 27 after an illness of three months. Mr. Siegel was born in Erie and at one time was manager of the Mutual Ice Co. there. He was a past president of the Pennsylvania and Ohio Ice Associations. Surviving are two sons.

CHARLES M. HOLLOWAY who retired 15 years ago as an executive of the City Ice Delivery Co., San Francisco, Calif., died November 27, after a brief illness. Since retirement he had been active in the Red Cross. He is survived by his widow Mrs. Mathilda Holloway and a son, Frank, of San Francisco.

FRANK BAKER who pioneered in the ice and cold storage business at Lampasas, Tex., died November 28 from a heart attack. He was 67 years old. In addition to his activities in the ice and cold storage business, he had large interests in other businesses and ranches.

NEW PLANTS AND IMPROVEMENTS

Information pertaining to proposed new plants, utilizing refrigerating equipment, as well as additions, improvements, and rehabilitation of existing plants. News items of such new plants and additions is invited for publication in this department.

CALIFORNIA

Stockton, Calif.—Yolland Ice & Fuel Co. has completed the installation of a new S & S ice vending machine, Model 16.

FLORIDA

Miami, Fla.—The City Products Corp. will oversee the completion of nine newly acquired S & S ice vending machines being installed here. Built by S & S Vending Machine Co. of California, the equipment was supplied by the F. B. Dickinson & Co. of Des Moines, Iowa.

INDIANA

Elwood, Ind.—To carry the off-season load, Home Ice & Coal Co. last month installed two new S & S ice vending machines.

MASSACHUSETTS

Watertown, Mass.—The Birds Eye-Snider Division of General Foods Corp., occupies new refrigerated storage facilities here. This will enable the handling of more volume and provide better and faster service.

MISSOURI

Marionville, Mo.—The Marionville Refrigerating Co. has a new three-story building under construction near the large storage and deep freeze plant. The new building is of steel and re-inforced concrete, and it is reported that one-half of the building has been leased to the Continent Frozen Food Co. and will be used as an egg processing plant.

NEW MEXICO

Santa Fe, N. Mex.—Another S & S Station, Model 16, is now selling ice 24 hours everyday for the Santa Fe Ice Co. of this city.

OKLAHOMA

Carnegie, Okla.—Installation of a new 165-horse power engine in the Carnegie Ice Company plant was recently completed. It uses natural gas for fuel, and is one of two engines that furnish power for the ice and locker plant.

OREGON

Pendleton, Ore.—Lamb Fruit Co., cooperating with the Smith Cold Storage plant which is being put back into use by rebuilding after the disastrous fire of a year ago, is planning a large expansion in the frozen pea industry.

TENNESSEE

Memphis, Tenn.—Park Ice Co. has been issued a $10,000 permit to build an ice house at 1383 Enterprise.

WASHINGTON

Chelan, Wash.—Lake Chelan Fruit Growers Cold Storage plant was completed recently. Built of reinforced concrete the two-story structure has a capacity of 225 cars of cold storage space. Refrigerator equipment is by Baker Ice Machine Corp. Lake Chelan Fruit Growers now has a total storage space of 1,100 cars.

Fires and Accidents

Columbus, Ga.—The Atlantic Ice and Coal Co., Seventeenth and First Aves., was damaged by fire recently, amounting to an estimated ten to fifteen thousand dollars. Flames raged in the two-foot-thick insulation of pine shavings protected by the heavy concrete outer portions and kept four fire companies on the scene for several hours. Investigation showed that the fire may have been caused by a defective gas heater in the office of the coal storage foreman. All records were destroyed but operations will continue to provide regular service.

Durant, Okla.—A blaze swept the Independent ice plant, 119 North Fourth, completely destroying the main switchboard and damaging the pump and oil houses. City firemen controled the flames before they spread into the main plant. The fire occurred as workmen were applying a new roof to the building and a bucket of roofing material overheated and burst into flame. A workman tossed a bucket of water on it, causing it to spread to the oil house.

REPAIR CEMENT

YOU CAN PERMANENTLY REPAIR AND WATERPROOF BREAKS, CRACKS AND HOLES IN STONE, CONCRETE, BRICK AND TILE.

COMCO READY-MIXED REPAIR CEMENT WILL DO THE JOB

Simply add water only and this cement becomes as hard as iron and sticks permanently to all concrete surfaces. It will not shrink. Comco Cement is waterproof, wearproof, dustproof and oilproof, and will withstand acid and alkali, producing an indestructible floor.

Comco Cement will withstand foot traffic after it has set 25 minutes. After 8 hours it will stand up under heavy-duty trucking. Comco Ready-Mixed Cement is chemically perfect, not just another flooring compound. It is guaranteed to stand up under all conditions, no matter how severe. Comco Cement will permanently line and waterproof hot and cold water tanks.

When ordering, specify Comco Resurfacing Cement for large areas, and state whether it is to be used in a refrigerated or hot room.

1 bag (100 lbs.) covers approximately 44 sq. ft. ¼-in. thick, the required thickness for heavy-duty trucking. 100-lb. bag.....$11.00

All prices F.O.B. Factory, Chicago

CONCRETE MATERIALS CORPORATION
318-320 W. HUBBARD ST., CHICAGO 10, ILLINOIS

A PRACTICAL WAY TO REDUCE REFRIGERATION COSTS

● As an example, in a 220-ton system a condenser pressure 25 psi above normal wastes $275 of power per month based on a cost of 1¢ per kwh. An Armstrong Purger will get rid of this air, bring the pressure down to normal and eliminate this costly waste. Satisfaction guaranteed.

ARMSTRONG MACHINE WORKS
861 Maple Street
Three Rivers, Mich.

SEND FOR BULLETIN 192

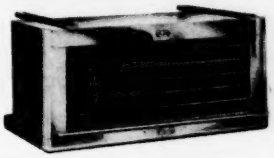
Complete data, prices and useful information. Free on request.

ARMSTRONG Forged Steel PURGER

SAVE SPACE! SAVE TIME! SAVE OPERATING COSTS! WITH RECOLD

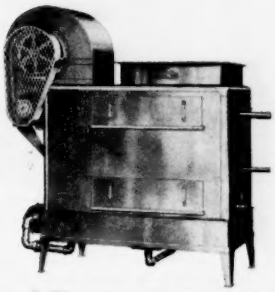
REFRIGERATION EQUIPMENT

Ever since the inception of water defrost coils, more and more refrigerated warehouse owners have been installing them with amazing results. Positive temperatures below 34° for every type of application. Mounted near the ceiling, out of the way from valuable storage space. Recold low temperature coils provide the answer to many unusual storage and freezing room problems.



Illustrated at the left is the well known Recold water defrost coil, Model number 2700 LT. 285 of these are now doing an exceptional job of providing low temperatures in the world's largest warehouse, Alford Refrigerated Warehouses at Dallas, Texas.

Illustrated at the right is the "Recold" DRI-FAN Evaporative Condenser. This product is setting new records of performance and provides many years longer service because of a revolutionary development which keeps moist air away from the fan section, thereby eliminating rust and corrosion.



OTHER RECOLD PRODUCTS

RECOLD SUPREME, for storage of fresh meats, flowers and produce.	RECOLD FLOOR UNITS Standard water defrost for temperatures below 34°.
RECOLD TINYMITE, for reach-in refrigerators from 20 to 150 cubic feet.	RECOLD HUMID AIR Evaporators for temperatures above 34°.
RECOLD SNUG-WALL, for walk-in and reach-in refrigerators.	AIR CONDITIONING EQUIPMENT For every installation.

Write today for complete catalog.

REFRIGERATION ENGINEERING, INC.
7250 East Slauson, Los Angeles 22, Calif.

NEW AND IMPROVED EQUIPMENT

MACHINERY-APPLIANCES-PROCESSES

Information contained in this department is furnished by the manufacturer of the article described and is not to be construed as the opinion of the Editor.

Vogt Introduces Package Unit

DESIGN and construction details have been released on a new Tube-Ice Package unit, made by the Henry Vogt Machine Co., Louisville, Ky. which was first shown at the National Hotel Exposition in New York City.

New Tube-Ice Package unit introduced by Henry Vogt Machine Co.

The machine is designed to manufacture 2000 lbs. of "cylinder" or "crushed" ice in twenty-four hours and is completely assembled, wired and piped at the factory. The standard unit contains a 3 hp. water cooled condensing unit, has a stainless steel casing and is offered with an insulated stainless steel lined ice bin which will hold approximately 650 lbs. of ice in storage. All operations are completely automatic, including the shutting off of the unit when the bin is full.

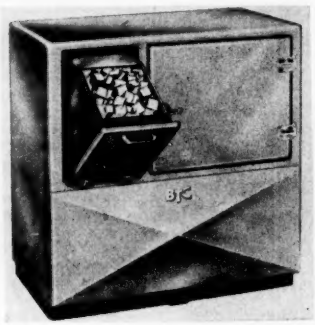
A reversible cutter permits the user to make either ice in the form of cylinders 1-¼ in O.D. x 1-½ in. long or crystal clear, crushed ice by merely moving a toggle switch on the control panel.

The stainless steel ice bin features "scoop out - shovel out" doors which permit the user to open the top door only for removing small quantities while both doors may be opened to give greater access for shoveling out large quantities.

Vogt Automatic Tube-Ice Machines have been manufactured in Louisville since 1938 and units are operating all over the world with capacities for single installations up to 264 tons of ice per day.

Recommends Distribution of Cuber Through Ice Manufacturers

A NEW, low-cost ice cube maker, "hailed as the ice companies' answer to the automatic cube maker competition," according to the manufacturer has been introduced by the Brewer-Titchener Corp.



Photograph of new BTC Rapid Freeze Ice Cube Maker.

Featuring simple, plug-in operation with no plumbing installations necessary, BTC's Rapid Freeze Ice Cube Maker is intended to open up a new rental market for ice manufacturers. A firm renting out 100 of the new units at a dollar per day, states the manufacturer, would be able to get back its original investment in ten months, and thereafter gross approximately $30,000 annually. (The BTC Rapid Freeze Ice Cube Maker carries a five-year warranty.) One service man and a small delivery truck can easily take care of all maintenance.

Capable of producing 2300 cubes or 250 lbs. of ice per day, the ice cube maker provides a continuous supply of ice cubes by means of a large, easy-opening refrigerated storage bin, which eliminates opening the freezing section to obtain ice. Ice cubes in storage bin it is said, remain dry because of the refrigerated compartment. At each freezing, 384 additional cubes are made in the separate freezing compartment.

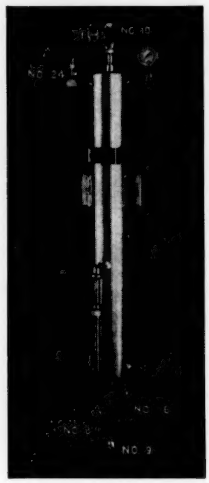
The unit's compact size—24 in. deep, 39 in. high and 38 in. wide—enables it to be moved about easily or placed in areas where space is at a premium. In bar installations, the cube maker slides under the bar and does not extend into working space.

The machine is equipped with 24 standard size, quick release trays which can make 384 cubes or 40 lbs. of ice in a single freezing. Cost per freezing is approximately 5 cents per bushel, subject to varying electric rates. The cubes produced are solid, hard frozen, and will last for approximately one hour in a glass of 65 F. water.

Refrigerated Sales Corp. at 19 West 44th Street, New York City has been appointed exclusive sales representative, and will handle all inquiries on the new unit, according to the manufacturer.

Air Purger for Small Refrigeration Plants

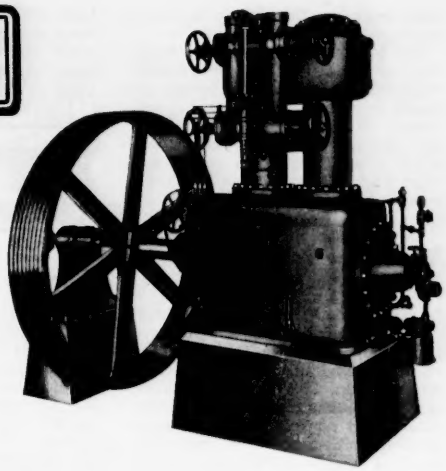
A NEW Air Purger, called the Midget, for the small refrigeration plant of 50 tons refrigeration, has been announced by Rex Engineering & Sales Co., Oklahoma City, Okla.



Midget Air Purger

Through the installation of an air purger, excess head pressure is reduced, non-condensable gases are purged and condensed gases automatically returned to the system. This results in more efficient operation of compressors, increased ton-

Sterling DEPENDABLE REFRIGERATION



The phrase "STERLING DEPENDABLE REFRIGERATION" is more than a slogan—it's a fact.

Built with rugged strength for endurance, with advanced design for efficiency and economy of operation, STERLING Ammonia Compressors are the product of more than fifty years of "know how" in the manufacturing of refrigeration machinery and equipment.

A complete range of sizes insures the correct compressor for each application.

Deliveries are, at present, current—most models of compressors are available from stock.

For complete information, see your nearest STERLING distributor, or write the factory.

REYNOLDS MANUFACTURING CO.

SPRINGFIELD *"Builders of Fine Refrigeration Equipment"* **MISSOURI**

A Book Written for the Engineer

The author, a man well versed in the construction and operation of ice making and refrigerating systems, has intended this work as a practical help to the engineer in his every day problems.

PRACTICAL REFRIGERATING ENGINEERS' POCKETBOOK

By John E. Starr

eliminates algebraic terms and tells the engineer in a simple manner how to determine if his plant is operating at the highest efficiency.

Cloth Binding, $2.50

NICKERSON & COLLINS CO.
435 N. Waller Ave., Chicago

CEMCO

Double Gig Ice Hoist
Fast - Sturdy - Dependable -

Send for details

THE CAPITAL ELEVATOR & MFG. CO.
424 W. Town St.
Columbus 8, Ohio

NOZZLES • DROP TUBES • CAN DOGS • CAN FILLERS • BLOWERS • BRACKETS • BAGS • HOISTS

• ICE CRUSHERS •

THE BEST THAT MONEY CAN BUY

Place your orders for air agitation equipment with us and be assured of receiving precision-machined parts, thus enabling you to make the very best clear raw water ice possible.

We have been serving the ice industry for 15 years and our customers know that although priced conservatively, our equipment can be depended on for satisfactory performance and economic operation.

It will pay you to investigate our facilities.

ICE PLANT EQUIPMENT CO., Inc.

WRITE OR TELEGRAPH **2543 Frankford Ave. Philadelphia 25, Pa.** TELEPHONE NEbraska 4-3055

• RUBBER TUBING •

TUBE CLEANERS • PUMPS • FILTERS • VALVES • ICE TONGS • THERMOMETERS • ICE PICKS

nage and a considerable reduction in power costs.

The Midget is so constructed that it insures continuous uninterrupted operation. It has a large storage capacity in which foul gases are collected. It may be installed close to the receiver or at any convenient place in the plant. Full details and price may be secured from Rex Engineering & Sales Co.

Treatment for Cooling Water Systems

THE development of a new algaecide and deodorant is announced by The Brooks Boiler Treatment Co., chemical engineers. The new product, Brooks Poly-Cide is a liquid readily emulsifiable with water. Because it is non-corrosive, non-scale forming and non-toxic, it represents an ideal treatment for cooling water systems. The stability of the emulsion formed with water makes it adaptable to closed systems. Small, infrequent "booster" shots are all that is required to maintain a clean system. Open systems can be treated in a similar manner. In treating once through systems one or two injections per day will suffice to prevent algae deposits.

Industrial plants conscious of sanitary conditions will be pleased to learn that a 5 per cent emulsion in water forms an effective deodorant and germicidal rinse for washrooms. It is available in 5, 15, 30, and 55 gallon containers. Literature and samples are available upon request from The Brooks Boiler Treatment Co., 3304 East 87th St., Cleveland 4, Ohio.

MANUFACTURERS' NEWS

Bergdoll Heads ASRE

JOHN G. BERGDOLL, JR., vice-president and works manager of York Corporation, York, Pa., who has been associated with this air conditioning and refrigeration firm for approximately 28 years, was elected president of the American Society of Refrigerating Engineers at the annual election of the organization held December 7, at the Edgewater Beach Hotel in Chicago.

Mr. Bergdoll is the fourth York Corporation executive to head ASRE. The late Thomas Shipley, founder and the first president of York Corporation, was president of ASRE in 1912. His brother, W. S. Shipley, who succeeded him as president of the York firm, served ASRE in the same capacity in 1924. L. S. Morse, former executive engineer, who is now retired, headed ASRE in 1936.

Joining ASRE in 1923, Mr. Bergdoll was a member of the organization's Board of Directors for several terms. As treasurer from 1943 to 1945, director again during the next two years and vice-president in 1948 and 1949, he was recently signally honored by being made a Fellow of the Society.

John G. Bergdoll

Mr. Bergdoll joined the York Corporation in 1912, when he enrolled for the York High School-York Corporation Cooperative course to learn the machinist trade. He entered Lehigh University in 1916, graduating in 1920 with a degree in mechanical engineering after which he returned to the York firm.

He served in various capacities in the engineering department before becoming works manager in 1943. On January 11, 1949 he was elected vice-president of York Corporation while retaining his position as Works Manager.

IPECO Completes 15 Years

THE Ice Plant Equipment Co., Philadelphia, Pa., has completed 15 years of service to the ice industry and related fields. Founded in 1934 by Albert L. Ribeiro who continues to be president and general manager, the company has a full line of air agitating equipment for manufacture of clear ice as well as related machinery and supplies.

Mr. Ribeiro's eldest son Albert has been affiliated with the Ice Plant Equipment Co. since the beginning, and his other son Walter joined it about three years ago.

MARTOCELLO ICE PICKS

"Cost You Less To Buy The Best"

Immediate Delivery on Plain Handle Ice Picks

BLADES

of High Carbon Tool Steel, accurately tempered to give you maximum use.

HANDLES

of Sound, Clear Hard Wood with Protective Flexible Lacquer Coating.

FERRULES

of Pressed Steel securely registered on Handle and Plated to Resist Corrosion.

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Est. 1880

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- AMMONIA COMPRESSORS
- AMMONIA VALVES
  Flanged and screw ends in all sizes from ¼" to 8"
- BACK PRESSURE VALVES
  For ammonia and Freon in all sizes from ¾" to 6"
- FLANGES AND FITTINGS

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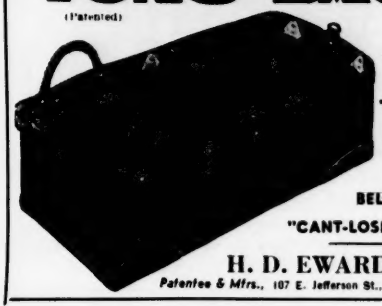

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Use *Air Clear* wherever food commodities are stored to reduce spoilage. General Ozone has a complete line of modern ozonizing equipment plus full service facilities for both old and new types. Write us today for further information.

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Manufacturers of ozone generating equipment for cold storage ● warehouses refrigerated cars ● walk-in coolers ● air recirculating systems.

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WITH REVOLUTIONARY NEW AUTOMATIC

LOADER SHAKER SIZER

This new Bateman unit, incorporating revolutionary design that eliminates vibration on frame of shaker, assures added years of service and economy. One man can keep unit in operation, bagging and loading magazine.

Three sizer screens, running on roller bearing in counter-balancing action, operate without vibration. Screen openings, 1½", ¾" and ⅜". Shaker motor ½ H.P. Processes 175 lbs. of ice per minute. Slow revolving drum, 12 large teeth, hold snow to absolute minimum. Removable plate on side of crusher so teeth can be changed easily and quickly. Five grate adjustments to help size ice before it reaches sizing screen.

LOW PRICE: Complete with motors, switches and galvanizing. F.O.B. Mineral Wells, Texas **$1,295**

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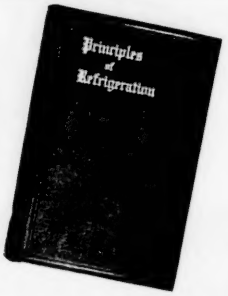
PRINCIPLES of REFRIGERATION



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- OPERATING ENGINEERS
- CONSULTING ENGINEERS
- SALES ENGINEERS
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PRINCIPLES OF REFRIGERATION, 3rd Edition (1947) revised by Wm. H. Motz, provides information and data for the practicing refrigeration engineer. Of special interest to erecting and operating refrigerating engineers, refrigeration machinery sales engineers, persons employed in building refrigerating machinery and those employed in ice making, cold storage plants or other establishments equipped with refrigerating machinery. Contains information that the refrigerating engineer should know in order that he may have complete and up-to-date knowledge.

Written in every day language and as free as possible from higher mathematics. The theoretical and fundamental operating principles are given attention first—followed by numerous practical considerations and the application of principles to the economic production of ice and refrigeration for various purposes.

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★ *Saves Space*

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CAN BE USED WITH ANY REFRIGERANT

SALES AGENCIES SOLICITED

Manufactured by

DETROIT ICE MACHINE COMPANY

2615 Twelfth St., Detroit 16, Mich.

Freezer Storage—70 Ft. x 90 Ft. x 11 Ft. High
The Terminal Cold Storage & Ice Co., Dayton, Ohio

York Promotes Serfass and Barnes

RAYMOND K. Serfass has been named assistant general sales manager of the York Corporation, York, Pa., is an announcement made by John R. Hertzler, vice-president and general sales manager. Mr. Serfass steps into his new position from that of industrial sales manager of the North Atlantic District of the Corporation, with headquarters in New York, a position he has held since 1945. In addition to the administrative and executive functions of his new position, he will, in the absence of Mr. Hertzler, assume the duties of the general sales manager.

Raymond K. Serfass

During 1932-34, Mr. Serfass gained valuable field experience in the New York and Newark offices of York Corporation, followed by a special factory training course at York, Pa. in 1934-35, after which he returned to the Newark office in the capacity of sales engineer. From 1937 until he was appointed industrial sales manager of the North Atlantic District, he served as sales engineer of the Rochester branch office.

Mr. Serfass was succeeded as industrial sales manager of the North Atlantic District by the promotion of Alvin N. Barnes, Jr. a veteran sales engineer, who has been with the York firm for nearly 30 years. Mr. Barnes took the student training course at the York factory during the period of 1920-23, upon completion of which he was assigned to the Charlotte, N. C., branch office as a sales engineer, remaining there until he was transferred to the New York Office in 1934.

United Ice Supply Announces Awards

THE United Ice Supply Co., Boston, Mass., announces that Mr. Dawson of the Crystal Ice Co., Corland, New York, was the winner of the Ice Pick Blade Contest at the recent National Ice Association Convention. C. F. Eldredge of the C. F. Eldridge Ice Co. in Auburn, N. Y., came in second. An award of 500 Ben Special Ice Pick Blades was presented to the winner.

TURNING RADIUS OF OTHER MAKES

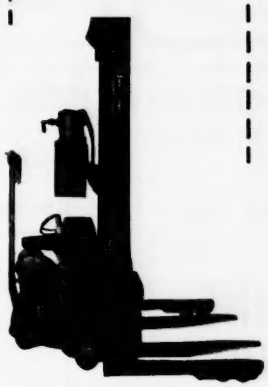
SMALLER TURNING RADIUS OF THE MOTO-TRUC

Gain Space AND REDUCE HANDLING COST

SHORTER OVERALL LENGTH, LOW POWER COST--

Two of many reasons why

MOTO-TRUCS *Pay Off!*



MOTO-TELESCOPIC HI-LIFT TRUCK

Capacity: 4,000 pounds, 80" lift; 2,000 pounds up to 144" lift. Patented articulating hinged spring unit holds drive wheel down on floor for better traction.

THE LARGEST COLD STORAGE COMPANIES ARE AMONG THE MANY USERS

Moto-Truc Motorized Battery Operated Walkie Type Trucks are especially adapted for cold storage operation.

EXCLUSIVE FEATURES:

Up to 15" shorter overall length, due to more compact power unit.

Operate in narrower aisles, leaving more space for storage.

Simple control reduces operator fatigue, increases efficiency. A turn of the wrist on easy grip roller type handle gives two speeds forward and two speeds reverse. Push buttons in the ends of handle operate the hydraulic lift.

Moto-Trucs are safe. Dead man controls and other safety features provide real protection for both operator and loads.

Power cost is low. You can keep Moto-Trucs busy at a cost of as little as 8c per 8-hour day.

Read all about Moto-Trucs — write for **Bulletin No. 49.**

The MOTO-TRUC Co.
1953 E. 59th Street
CLEVELAND 3, OHIO.
ORIGINATORS OF MOTORIZED HAND TRUCKS

SHANK REFRIGERATION PRODUCTS

Your Best Buy... The're Dependable

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All - Steel GAUGE SETS

All - Steel construction. Automatic shut off of liquid in case of glass breakage. Composition packing rings give long life, no-leak seal.

SEMI - STEEL SHUT - OFF VALVES

Highest grade non-porous metal—full size ports—clean cut threads. Back seated stem—Shank design base—perfect alignment. Long life packing ring.

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ACME ... *the Gas Mask that checks* HUFF and PUFF

You can wear the Acme Full-Vision Gas Mask two or three times as long as others without worrying about "huff and puff." An exclusive Acme feature, the Dead Air Check Valve, actually limits the amount of carbon dioxide the wearer rebreathes and thus helps to check breathing difficulties at their source.

This is another Acme innovation that proves that protection can be comfortable.

Write for the complete story on Acme Gas Masks for the refrigeration industry.

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Plain—Printed—Replacement Blades

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Only the Highest Quality Merchandise and efficient service necessary for the proper and profitable operation of your business. Write for our 1949 catalog.

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Ice Making and Refrigeration - Industrial Power Plants
Reports, Appraisals and Management

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WE CONTINUE YEAR AFTER YEAR
to make the kind of Ice Picks that will give YOUR customers satisfaction and build up GOOD WILL FOR YOU.

PRICE UPON REQUEST

VIVIAN MANUFACTURING CO. **4132-38 Folsom Ave., St. Louis 10, Mo.**

Baker Names New Sales Manager

THE Board of Directors of Baker Refrigeration Corp. at South Windham, Maine have elected Frederick W. Smith to the position of vice-president in charge of sales. Mr. Smith is resigning his present position as products manager of merchandising equipment of the Carrier Corporation at Syracuse, N. Y. where he has been connected for over five years and will assume his new duties shortly after January 1. At Baker, he will have complete charge of all sales activities in marketing its line of compressors, condensing units, air conditioning and ice making equipment.

The Directors also appointed J. A. Kelly to the newly created position of manager of production at both Baker Refrigeration Corporation plants at South Windham.

Mr. Kelly has been connected with Baker since June actively in charge of moving the machine tools and other equipment to the newly acquired Little Falls Plant is practically completed and compressor and condensing unit production increasing daily.

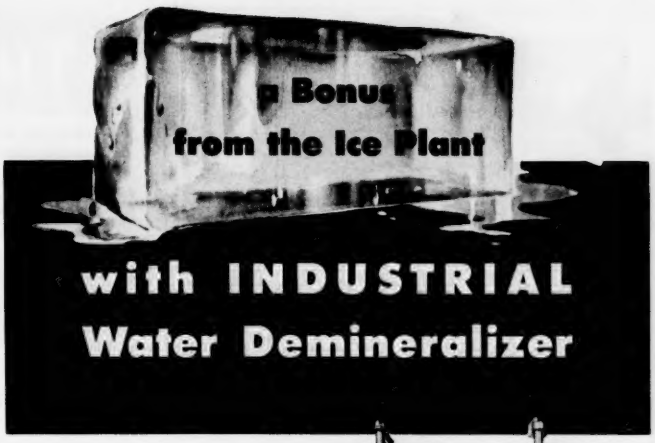
CATALOGS AND BULLETINS

Pure Carbonic New Catalog

THE publication of a new 12-page, illustrated catalog of regulators for carbon dioxide gas is announced by Pure Carbonic Inc. The catalog explains the purpose of CO_2 regulators, includes a regulator selector guide and tells in detail the purpose and outstanding features of the most popular types of Pureco single-stage and two-stage regulators. Also included is a page on regulator accessories and a page of practical "Operating hints". These CO_2 regulators are used in beverage manufacture, beer draughting, soda fountain carbonators, industrial processes, laboratories and special applications. A free copy may be obtained from Pure Carbonic, Inc., 60 East 42nd Street, New York 17, N. Y.

Booklet on Fiberglas Thermal Insulation

A NEW, 16-page booklet describing all forms of Fiberglas thermal insulations for industrial and building applications has been issued by Owens-Corning Fiberglas Corp. Data on thermal conductivity and sound absorption properties are included. The booklet is illustrated with numerous application photographs. Copies may be obtained from Owens-Corning Fiberglas Corporation, Toledo 1, Ohio.



A typical two-bed Industrial Water Demineralizer. Standard models available with capacities up to 1000 gph. Special units of any capacity engineered to requirements.

Here's how it works...

Instead of running ordinary city water into the freezing tanks, it is passed through the Industrial demineralizer where beds of ion-exchange resins remove the dissolved mineral salts—delivering the chemical equivalent of pure water.

With this pure water there are no minerals to deposit in the core—so the whole core-pulling operation is eliminated. Furthermore, the amount of ice which cracks in the cans is appreciably reduced. And the transparency of the whole cake is improved—your customers will notice the difference and like it.

It's easy to find out how to get this big bonus from your ice plant. Send us an analysis of the water you are using, the quantity you need, and at what rate (gallons per hour). We will send you complete information on demineralized water, estimate of costs, performance data, etc. Better look into it right away.

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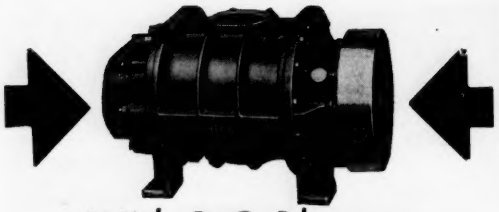
Vulcanized Linings • Molded Products

WATER DEMINERALIZERS



With R-C Blowers, '50 won't catch you short!

Did lack of capacity or downtime catch you short last summer? Plan now to stay ahead this year with R-C Rotary Positive Blowers. Assure yourself a constant, pre-determined volume of air that may be varied to meet your seasonal demands.

The simple design and sturdy construction of R-C Blowers mean years of continuous ice plant service with a minimum of maintenance. You can select a size to fit specific needs. Write us about your requirements or for Bulletin R-C 1247, without obligation.

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One of the Dresser Industries

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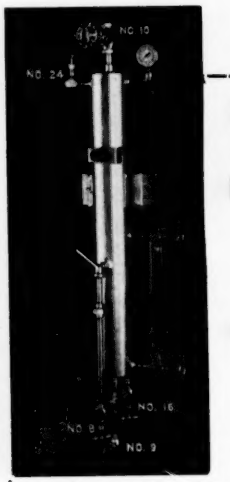

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At a price you can afford

BIG PRODUCTION MAKES THIS POSSIBLE

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Small but Mighty — designed especially for Refrigerating Plants of 50 ton refrigeration, and lower capacities. Does the same job, just as efficiently, as larger high priced models. Reduces Power Costs by purging non-condensable gasses—assures uninterrupted operation.

WRITE, WIRE, PHONE for details — and NEW LOW PRICE.

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THE BUYERS

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Vogt Machine Co., Henry, Louisville, Ky.

AIR AGITATING SYSTEMS AND FITTINGS
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Refrigeration Engineering Corp., Philadelphia, Pa.

AIR CIRCULATORS
Reynolds Electric Co., River Grove, Ill.

AIR COMPRESSORS
Baker Refrigeration Corp. So. Windham, Maine
Frick Co., Waynesboro, Pa.

AIR CONDITIONING EQUIPMENT
Baker Refrigeration Corp. So. Windham, Maine
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Niagara Blower Co., New York, N.Y.
Refrigeration Engineering, Inc., Los Angeles, Calif.

AIR PURIFYING EQUIPMENT
General Ozone Corp., Chicago, Ill.

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Voss, Inc., J. H. H., New York, N. Y.

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Creamery Package Mfg. Co., Chicago, Ill.
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Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
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Vogt Machine Co., Henry, Louisville, Ky.

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Voss, Inc., J. H. H., New York, N. Y.

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Bower Chemical Mfg. Co., Henry, Philadelphia, Pa.
Mathieson Chemical Corp., Baltimore, Md.
National Ammonia Div., DuPont, Wilmington, Del.

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Howe Ice Machine Co., Chicago, Ill.
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Howe Ice Machine Co., Chicago, Ill.
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Pittsburgh Pipe Coil & Bending Co., Pittsburgh, Pa.
Rempe Company, Chicago, Ill.
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Vogt Machine Co., Henry, Louisville, Ky.

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Ophuls & Associates, Fred, New York, N. Y.

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Frick Co., Waynesboro, Pa.
Phillips & Co., H. A., Chicago, Ill.
Rex Engineering & Sales Co. Oklahoma City, Okla.
Reynolds Electric Co., River Grove, Ill.

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Index Coupon & Supply Co., La Porte, Ind.
Union Bag & Paper Corp., New York, N. Y.
United Ice & Oil Supply Co., Boston, Mass.

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Union Bag & Paper Co. New York, N. Y.

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Vogt Machine Co., Henry, Louisville, Ky.

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Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Martocello & Co., Jos. A., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

BOILERS
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Vogt Machine Co., Henry, Louisville, Ky.

BOILER TUBES
Byers Co., A. M., Pittsburgh, Pa.

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Nickerson & Collins Co., Chicago, Ill.

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Refrigeration Engineering Corp., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Roots-Connersville Blower Corp., Connersville, Ind.
Vogt Machine Co., Henry, Louisville, Ky.

BRINE COOLERS
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Baker Refrigeration Corp. So. Windham, Maine
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Refrigeration Engineering Corp., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Wright Chemical Corp., Chicago, Ill.

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(See Dumps, Can)

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Gifford-Wood Co., Hudson, N. Y.

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Concrete Materials Corp., Chicago, Ill.

COAL HANDLING MACHINERY
Gifford-Wood Co., Hudson, N. Y.

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Creamery Package Mfg. Co., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Howe Ice Machine Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburg Pipe Coil & Bending Co., Pittsburg, Pa.

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Armstrong Cork Co., Lancaster, Pa.
Frick Co., Waynesboro, Pa.
Mundet Cork Corp., Brooklyn, N. Y.
Refrigeration Engineering Corp., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Butcher Boy Cold Storage Door Co., Chicago, Ill.
Jamison Cold Stge. Door Co., Hagerstown, Md
Refrigeration Engineering Co., Minneapolis, Minn.

COMPRESSORS
(See Ice Making and refrigerating Machinery)
(See Air Compressors)

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Baker Refrigeration Corp. So. Windham, Maine
Creamery Package Mfg. Co., Chicago, Ill.
Dersch, Gesswein & Neuert, Inc. Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
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Refrigeration Engineering Corp., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Martocello & Co., Jos. A., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio

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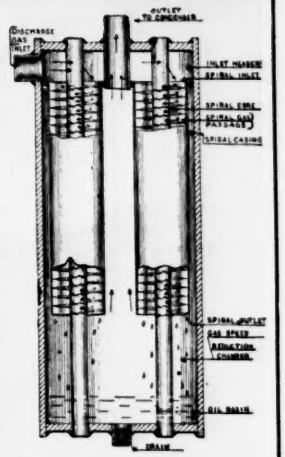

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THE BUYERS

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Refrigeration Engineering Corp., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

ELEVATING & CONVEYING MACHINERY
Capital Elevator & Mfg. Co., Columbus, Ohio
Gifford-Wood Co., Hudson, N. Y.

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(See Architects and Engineers)

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Frick Co., Waynesboro, Pa.

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Refrigeration Engineering, Inc., Los Angeles, Calif.

EVAPORATORS
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Creamery Package Mfg. Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Niagara Blower Co., New York, N.Y.
Refrigeration Engineering, Inc., Los Angeles, Calif.
Vogt Machine Co., Henry, Louisville, Ky.

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National Pipe Bending Co., New Haven, Conn.
Vogt Machine Co., Henry, Louisville, Ky.

FIBERGLAS
Armstrong Cork Co., Lancaster, Pa.

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United Ice & Oil Supply, Boston, Mass.

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Martocello & Co., Jos. A., Philadelphia, Pa.

FILTERS, WATER—INDUSTRIAL
Industrial Filter & Pump Mfg. Co. Inc., Chicago, Ill.

FILTRATION EQUIPMENT
Industrial Filter & Pump Mfg. Co. Inc., Chicago, Ill.

FIN COILS
Acme Industries, Inc., Jackson, Mich.
Howe Ice Machine Co., Chicago, Ill.
Rempe Company, Chicago, Ill.

FIRST AID SUPPLIES
Acme Protection Equipment Co., Chicago, Ill.

FITTINGS
Dersch, Gesswein & Neuert, Inc., Chicago, Ill.
Henry Valve Co., Chicago, Ill.

FOOD FREEZING EQUIPMENT
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Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Vogt Machine Co., Henry, Louisville, Ky.

FROZEN FOOD LOCKERS
Knickerbocker Stamping Co., Parkersburg, W. Va.
Rempe Company, Chicago, Ill.

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National Pipe Bending Co., New Haven, Conn.

GAS AND OIL ENGINES
Caterpillar Tractor Co., Peoria, Ill.

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Ohio Galvanizing & Mfg. Co., Niles, Ohio

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Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.

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Union Bag & Paper Corp., New York, N. Y.

ICE BLOWERS
Gifford-Wood Co., Hudson, N. Y.

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Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Knickerbocker Stamping Co., Parkersburg, W. Va.
Martocello & Co., Jos. A., Philadelphia, Pa.
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Refrigeration Engineering Corp., Philadelphia, Pa.
Vogt Machine Co., Henry, Louisville, Ky.

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Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
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Martocello & Co., Jos. A., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
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Refrigeration Engineering Corp., Philadelphia, Pa.
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Martocello & Co., Jos. A., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.

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Refrigeration Engineering Co., Minneapolis, Minn.
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Ice Plant Equipment Co., Inc. Philadelphia, Pa.
Index Coupon & Supply Co., La Porte, Ind.

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United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Vivian Mfg. Co., St. Louis, Mo.

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Thermo Cuber Co., Inc., Chicago, Ill.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Gifford-Wood Co., Hudson, N. Y.

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United Ice & Oil Supply Co., Boston, Mass.

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Creamery Package Mfg. Co., Chicago, Il.
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Detroit Ice Machine Co., Detroit, Mich.
Frick Company, Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Kehoe Machinery Co., Inc., R. P., Ridgefield Park, N. J.
Martocello & Co., Jos. A., Philadelphia, Pa.
Refrigeration Engineering Corp., Philadelphia, Pa.
Reynolds Mfg. Co., Springfield, Mo.
Vogt Machine Co., Henry, Louisville, Ky.

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Martocello & Co., Jos. A., Philadelphia, Pa.
United Ice & Oil Supply Co., Boston, Mass.
Vivian Mfg. Co., St. Louis, Mo.

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Towal Mfg. Co. Inc., Mount Vernon, Ill.

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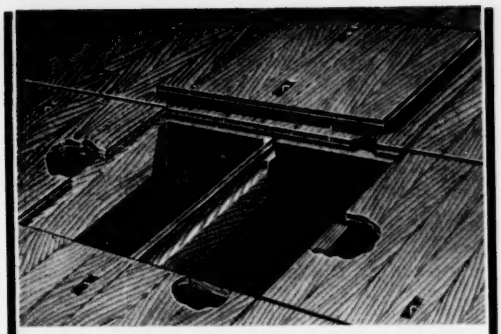

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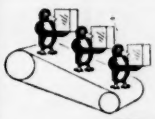

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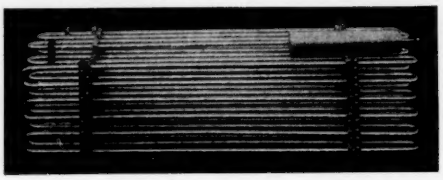

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Sun Oil Co., Philadelphia, Pa.
Texas Co., The, New York, N. Y.

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Philadelphia Pipe Bending Co., Philadelphia, Pa.
Pittsburgh Pipe Coil & Bending Co., Pittsburgh, Pa.
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Vogt Machine Co., Henry, Louisville, Ky.

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Refrigeration Engineering Corp., Philadelphia, Pa.
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Layne & Bowler, Inc., Memphis, Tenn.

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Roots-Connersville Blower Corp., Connersville, Ind.

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Roots-Connersville Blower Corp., Connersville, Ind.

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Deming Co., The, Salem, O.
Frick Company, Waynesboro, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.
Vogt Machine Co., Henry, Louisville, Ky.

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United ce & Oil Supply Co., Boston, Mass.

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Refrigeration Engineering Corp., Philadelphia, Pa.

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Phillips & Co., H. A., Chicago, Ill.
Refrigeration Engineering Corp., Philadelphia, Pa.
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Voss, Inc., J. H. H., New York, N.Y.

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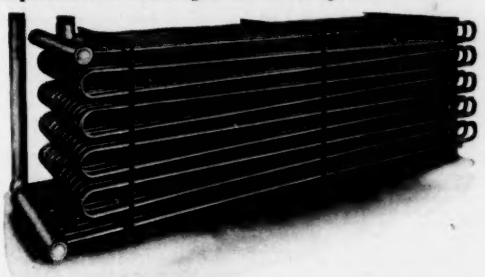

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All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for the purchase and sale of USED equipment, existing and used plants, and surplus material.

POSITIONS AND HELP WANTED

POSITION WANTED—As Chief Engineer. 37 years experience as chief engineer in a large ice, cold storage plant; high and low temperature and servicing to ice cream manufacturing companies. 10 years steam, 8 years electric, 13 years Diesel Electric, 5 years electric on plant consisting of approximately 475 ton refrigeration. All of the above changes made under my personal supervision. Capable of handling of all kinds of construction, erection, maintenance, repair and operation pertaining to a plant of this kind and size. Services available in approximately 10 days. Can furnish gilt edge references. Further information supplied if you are interested. A. B. Dickson, 7131 Camp St., New Orleans 18, La.

POSITION WANTED—Available immediately, background 36 years refrigeration (only three companies). Erecting, operating, sales engineering, district manager, all large ammonia equipment. Progressive, alert, creative, producer; prefer district management or field sales engineering contacting distributors, large equipment or components where earnings will be tops through salary, bonus, and/or commissions. Patentee dozen patents. Age only 53. Will carefully consider any territory, or offer, and complete details in first letter. Well known with exceptional contacts one phase of industry. Promptness and permanence paramount consideration. Address Box JA-11, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

WANTED—This advertiser, long experienced in refrigeration engineering, will consider grouping small number of items, even compressors or plant components, as manufacturers representative out of Cincinnati; commission basis, where earnings can be five figure. Must be quality products with past record of customer satisfaction, and leads. Give complete details, outline territory, prices, commissions, 1949 sales in territory in first letter. Address Box JA-9, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

ICE PLANTS—*Wanted and For Sale*

FOR SALE—Complete 20 ton Arctic Pownall ice manufacturing plant with two 9x9 compressors, 1 each York 9x9, Frick 6x6, Baker 4½x5 self-contained unit, York 5x5 self-contained unit. Two Lipman 4 cylinder self-contained units; 1¼"x5" weld return bends. Frick 10x10 pistons and crank shafts, flywheels. 1 each Fairbanks-Morse 150 and 180 h.p. Diesel engines. 1 each 40 and 60 KVA AC generators with freezer doors, pipe coils, ammonia fittings; 15 h.p. G.E. DC motor. 1—30 h.p. AC motor. Parke Pettegrew & Son Co., 370 W. Broad St., Columbus 8, Ohio.

FOR QUICK SALE

Complete 35 ton ice manufacturing plant 440 cans including 10x10 York compressor driven by Otto Diesel. Also Fairbanks-Morse Diesel engine 200 h.p., 300 r.p.m. and Westinghouse generating set, 220V, 3 ph—60 cycle, complete with exciter, switch gear, silencer, etc. Excellent condition. Everything complete $5800. Write for details. Address Box JA-4, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

FOR SALE—Modern ice plant, 20 tons capacity. Located in deep South; good climate, large territory; good future. Could stand enlarging to double its size. About 4 years old. Must sell on account of sickness. No reasonable offer refused. Cash or terms. An opportunity of a lifetime to a person sincerely interested in purchasing an ice plant. Address Box NV-16 Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

FOR SALE—Because of ill health the owner is forced to sell this very prosperous business. Ice plant with 100 ton daily capacity, large storage, 80 substations, and considered one of the best plants in Iowa. This business is over 50 years old, wonderfully equipped and in territory that is not competitive. Write Dukes-Law Company, Centerville, Iowa.

FOR SALE—Complete ice plant, 500 ton daily capacity, to be dismantled; 2400—400 lb. ice cans, Frick 10 x 10, two Wolfe compressors, two cranes, dump and filling equipment, blowers, motors, etc., at your own price. Gordon Equipment Co., 6530 W. Jefferson, Detroit 17, Mich.

USED MACHINERY—*Wanted and For Sale*

FOR SALE—Two 2 h.p. agitators; one 3 h.p. agitator; one 1 h.p. core pump; one 5 h.p. blower; one 3 h.p. blower; one Uline scoring machine; 206 cans 11 x 22 x 50; 350 cans 11½ x 22½ x 45. Write P.O. Box 53, Cincinnati, Ohio.

FOR SALE—3 x 3 twin Fricks and 4 x 4 Yorks self-contained units. 3 x 3, 4 x, 5 x 5, 6 x 6, 7½ x 7½, 8 x 8 and 9 x 9 York medium speed compressors. One 20 and one 40 ton Vogt horizontal shell and tube condensers. One 2 h.p. vertical agitator. Two 10 h.p. Freon units. Four Freon blowers for walk-in coolers. Write E. Niebling, 1318 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE—One 6½"x5" V/W York ammonia booster compressor 8 cylinder V-belt drive complete with base, including 440 volt A.C. motor and 36"x12' long D.E. gas and liquor cooler plus valves. This equipment is new and has never been installed. If interested contact W. A. Moore, General Manager, New Orleans Cold Storage & Warehouse Co. Ltd., 305 Gaiennie St., New Orleans, La.

FOR SALE—York 12½ x 14½ double cylinder, single acting, vertical compressor, direct connected to 150 h.p., 2200 volt, 3 phase, 60 cycle, 164 r.p.m., synchronous motor. Motor is complete with starting panel, instrument board, etc. Compressor has capacity of 90 tons refrigeration at 25# suction. Standard Ice Co., 219 Lee Bldg., Memphis, Tenn.

USED MACHINERY—*Wanted and For Sale—Cont.*

FOR SALE—Brand new ammonia compressors, one 8"x8" Frick, three 5"x5" Worthingtons, all of latest high speed type and include V belt drives. Priced right. Address Box JA-5, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44.

WANTED—In the market for any good used refrigerating and ice making equipment you may have for sale. Address Box DC-19, Ice and Refrigeration, 435 N. Waller Ave., Chicago 44, Ill.

FOR SALE—10 ton York Flakice machine. Like new. $7,500.00. Star Fish & Oyster Co., Inc., State Docks, Mobile, Ala.

FOR SALE—ICE PLANTS AND EQUIPMENT

1—30 ton York ice making plant—Trunk coil 4 can pull electric driven.
1—25 ton York ice making plant—Brine coolers electric driven.
1—10 ton York ice making plant—Brine coolers electric driven.
1— 5 ton York ice making plant—Brine coolers electric driven.

AMMONIA COMPRESSORS

1—10x10 York 300 r.p.m. direct connected to 100 h.p. synchronous motor.
1—10x10 York 275 r.p.m. F.F.L.
1—9x9 York 250 r.p.m. F.F.L.
2—7x7 Worthingtons 400 r.p.m. 50 h.p. motors.
2—6½x6½ Yorks 300 r.p.m. F.F.L.
1—6¼x6¼ Baker 300 r.p.m. F.F.L.
1—6x6 York 360 r.p.m. late type.
1—6x6 Frick 277 r.p.m.
1—5x5 York self-contained unit.
1—4x4 York self contained unit.
4—16" dia. x 18' L. horizontal shell & tube condensers, 42—1¼" tubes.
1—Gifford Wood ice scoring machine 300# blocks.
4000' of 2" pipe coils.
1—36"x10' long horizontal brine cooler 149—2" tubes.
300—11½x22½x44" ice cans.
100—1x22x46" ice cans.
New ice crushers and crusher blowers.

B & E REFRIGERATING COMPANY
2 Orange St., Newark 2, N. J.
Phone: Mitchell 3-7790 Cable Address "BERECO"

FOR SALE

Two 100 Ton Ice Plants

Both are Modern Ice Plants in A-1 Condition adjacent to New York City. Buildings of heavy construction with ample storage room and growth. Going business with established retail and wholesale dealers, reasonably priced.

Address Box No. JA-2, Ice and Refrigeration, 433 N. Waller Ave., Chicago 44, Ill.

FOR SALE—ICE PLANTS & EQUIPMENT

1—20 Ton York Ice Plant electric driven.
1—30 Ton York Ice Plant electric driven, herringbone coils. late type.
1—100 ton Ice Plant Electric driven.
1—10"x10" York two cylinder ammonia compressor.
1—6½"x6½" two cylinder York ammonia compressor, high speed.
1—6"x6" two cylinder Frick ammonia compressor, high speed.
1—6"x6" two cylinder Voss high speed ammonia compressor.
2—4"x4" two cylinder York high speed ammonia compressor.
1—3"x3 two cylinder Frick unit, high speed.
1—York shell and tube condenser 28" dia. x 16' L, 51—2" tubes.
1—Uline 300# Ice Scoring Machine
2—16" dia. x 10'-0" long 6 pass enclosed type ammonia condenser.
1—25" dia. x 10'-0" long 5 pass enclosed type ammonia condenser.
2—Perfection Ice Scoring Machine 300# blocks.
2—Submerged open type brine coolers, 36" dia. x 12' long.—239—2" tubes horizontal agitators.
600—11"x22"x18" ice cans.

Brine coolers, double pipe 2" and 2" horizontal brine coolers, submerged shell and tube type. 1¼" and 2" ammonia coils, approximately 10,000 feet. Send us your requirements on any equipment you may need.

ENTERPRISE EQUIPMENT CORPORATION
Phone Yonkers 8-8118-9
77-79 Alexander St., Yonkers, N. Y.

USED ICE MACHINES AND EQUIPMENT

All Used Equipment Is Reconditioned in Our Modern Machine Shop

THIS IS ONLY A PARTIAL LIST—WRITE ABOUT ANY REQUIREMENTS WHICH YOU HAVE WE ARE BUYING ADDITIONAL EQUIPMENT ALL OF THE TIME.

Compressors With or Without Motors

	Item No.
1—4x4 York, 300 RPM	16
6—6x6 York's, 200 RPM	20
1—6x6 Frick, 257 RPM	21
2—6½x6½ Arctics, 350 RPM, forced feed lub.	30
1—7¼x7¼ Baker, 350 RPM, forced feed lubrication	35
1—7x7 Frick, 200 RPM	40
1—7½x7½ York, 200 RPM	51
2—9x9 Arctic, 300 RPM, forced feed lub.	62
1—9x9 Frick 225 RPM direct connected to a 60 HP synchronous motor, forced feed lubrication	67
2—9x9 Late type Yorks, 400 RPM, forced feed lub.	69
1—9x9 Frick, 200 RPM	70
1—9x9 York, 200 RPM	71
1—9x9 Worthington, 325 RPM, forced feed lub.	72
1—10x10 De La Vergne, 360 RPM, forced feed lub.	73
1—10x10 York, 257 RPM, forced feed lub.	80
1—10x10 Carbondale, 100 HP synch. motor, 350 RPM	81
3—10x10 York's, 225 RPM, semi-forced feed lub.	82
1—12x12 Frick, Forced feed, 300 RPM	89
1—11x13 York, 164 RPM, forced feed lub.	90
1—17x18 Frick, direct conn. 300 HP synch. motor	91

Diesel Driven and Diesel Engines

1—8x8 York—Direct connected to 50 H.P. Fairbanks-Morse at 257 R.P.M.	210
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1—150 H.P. Van Severin—300 R.P.M.—Diesel engine	212

Steam Driven

1—18 ton Vertical 6½x6½ Arctic	321
1—7½x7½ Vertical York, 200 R.P.M. direct connected to steam engine	326
1—8x8 Vertical York, 300 R.P.M. direct connected	327

Complete Ice Plants

	Item No.
1—15-ton electric driven plant	630
1—600 Can Trunk Coil Type—York Plant, Brand New Tank. *Complete with 10 Can Grids. This plant is equal to new*	631
Brand New 8 to 10-ton Clear Ice-Making Plants—110 Cans—Electric or Diesel Drive—2 Can Pull	632
2—247 Can, 22-ton ice plants, like new	632A
1—35-38 ton New Clear Ice Making Plants	635

Self-Contained Units

1—5x5 York—390 R.P.M.	743
1—4½x5 Lipman—360 R.P.M.	744
1—3x3 Worthington	748
1—5x5 Frick—Forced Feed—400 R.P.M. Latest Type	758

Brine Coolers

1—34x12—96—2—Retubed	801
1—34x10—100—2	802
1—48"x16'—130—2" tubes	808

Condensers

3—100 ton shell and tube condensers retubed	919
2—Stands—Vogt Multi-tube—Each stand 6 pipes high. Each pipe 9"x18" with 7—2" tubes	920
1—125-ton, Vertical Shell & Tube, 196 2" tubes	921
1—120 ton, 216—2" retubed Vertical Shell & Tube	922
2—20 ton Horizontal—retubed	924

Ice Cans

400—11½"x22½"x44"—cap refinished in zinc

Pipe

10,000 feet wrought Iron pipe—2"—like new 451

NEW EQUIPMENT FOR IMMEDIATE DELIVERY

Compressors With or Without Motors

	Item No.
3x3 to 5 x 5—390 R.P.M.	1001
6x6 to 10x10—390 R.P.M.	1002
3x3 to 5 x 5—Self-contained units, complete	1003
5x5—Self contained—15 H.P. motor—V Belt	1004

Ammonia Condensers

4—12¾x12 Horizontal—36—1¼" tubes	1020
2—30x14 Vertical 109—2" tubes	1021
1—16"x10"x10' Shell and Tube Condenser, 60 1¼" tubes	1022

Evaporative Condensers

Ice Cans

50—100 lb. cans—15½"x8"x31"	1041
40—50 lb. cans—6"x12"x26"	1042

Ammonia Valves and Fittings

⅜" to ¾"—Screwed Expansion Valves	1050
½" to 2"—Screwed Globe Valves	1051

	Item No.
1" to 6"—Square Flanged Globe Valves	1052
Check Valves	1053
Relief Valves	1054
Strainers	1055
Steel & Malleable Fittings	1056
Extra heavy Ammonia Nipples	1057

Ammonia Gauges

High and Low Pressure Type 1060

Ammonia Receivers

All Sizes.

Ice Crushers

Gas and Electric Driven 1070

Agitators

New 2 H.P. and 3 H.P. Vertical Agitators

Cold Storage Doors

Receivers and Oil Separators

All sizes 1080

Robert P. Kehoe Machinery Company, Inc.

6 EUCKER ST. & BERGEN TURNPIKE
RIDGEFIELD PARK, N. J.

PHONE: HAckensack 2-8554-5
CABLE ADDRESS: KEHOEINC.

Venders Cut Delivery Costs..Sustain Winter Ice Volume In Eastern & Midwestern Cities

Last year in Minneapolis, Chicago and St. Louis winter experiments showed that greater volume was obtained by keeping normal off season truck deliveries and letting Sturdy-Built Stations capture the plus market. By letting Sturdy-Built Stations carry the off season load, profits were substantially increased.

S & S equipped stations sell ice 24 hours a day, serving occasional customers who account for 27% of all ice sold through Sturdy-Built Stations as well as the *"after hour"* customers. (45% of all ice sold from Sturdy-Built Stations is purchased between 4:00 P.M. and 8:00 P.M.).

You can depend on Sturdy-Built to increase volume, lower distribution costs and stretch profits. The dependability of S & S Ice Vending Machines and Sturdy-Built Stations for 18 years remains unequaled and unchallenged.

Phone, Wire or Write for Detailed Information.

S&S ICE VENDING MACHINES

IN THE WEST
S&S VENDING MACHINE CO.
670 Lincoln Avenue
San Jose, California

IN THE EAST
F. B. DICKINSON CO.
Highland Park Station
Des Moines, Iowa

REFRIGERATED STURDY-BUILT ICE VENDING STATIONS

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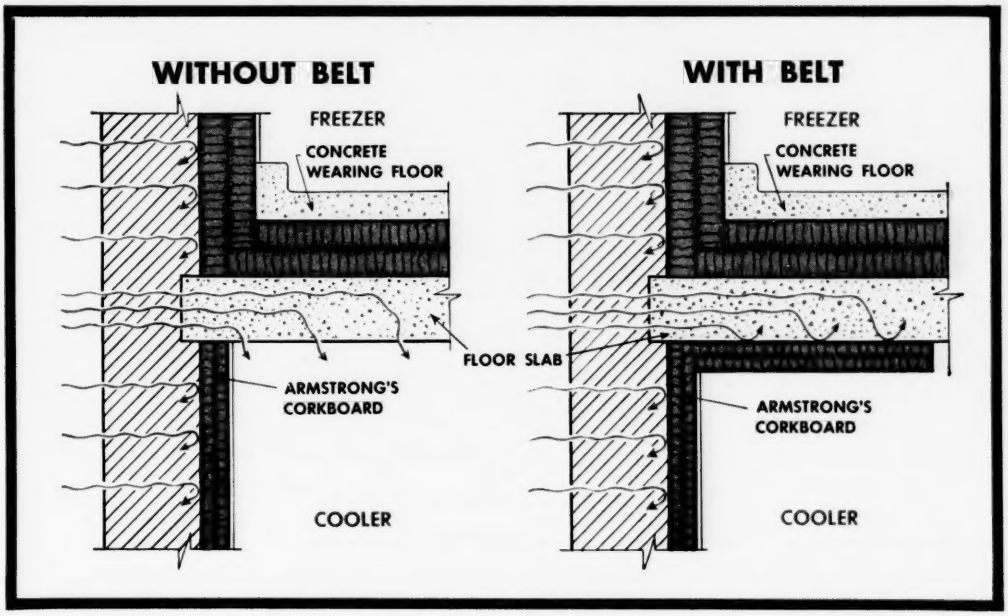

How a belt of insulation prevents trouble

When the floor slab between refrigerated spaces is supported by the walls, heat travels along the slab into the room. This flow of heat not only increases refrigeration loads but also results in moisture condensation under the slab.

Extra insulation on the wall doesn't improve this situation. Even insulation on the floor between cold rooms won't eliminate it. But a belt of Armstrong's Corkboard on the underside of the slab, extending about three feet into the room, corrects it—and at low cost.

No such belt is required if the slab is supported by columns within the building and stands free of the outside walls. This permits an unbroken envelope of corkboard insulation to completely surround the entire refrigerated space.

The specification shown here, solving a common insulation problem in a practical and low-cost manner, is typical of the thinking of the men who plan Armstrong insulation jobs.

For more than 40 years these Armstrong engineers have been finding the right answers to all kinds of insulation problems. When you have any questions about low-temperature insulation, call on Armstrong's Contract Service. In addition to Armstrong's long experience and time-tested engineering practices, this complete service furnishes top-quality insulating materials and skilled mechanics to apply them. For complete information, write today to Armstrong Cork Company, Building Materials Division, 4501 Concord Street, Lancaster, Pennsylvania.

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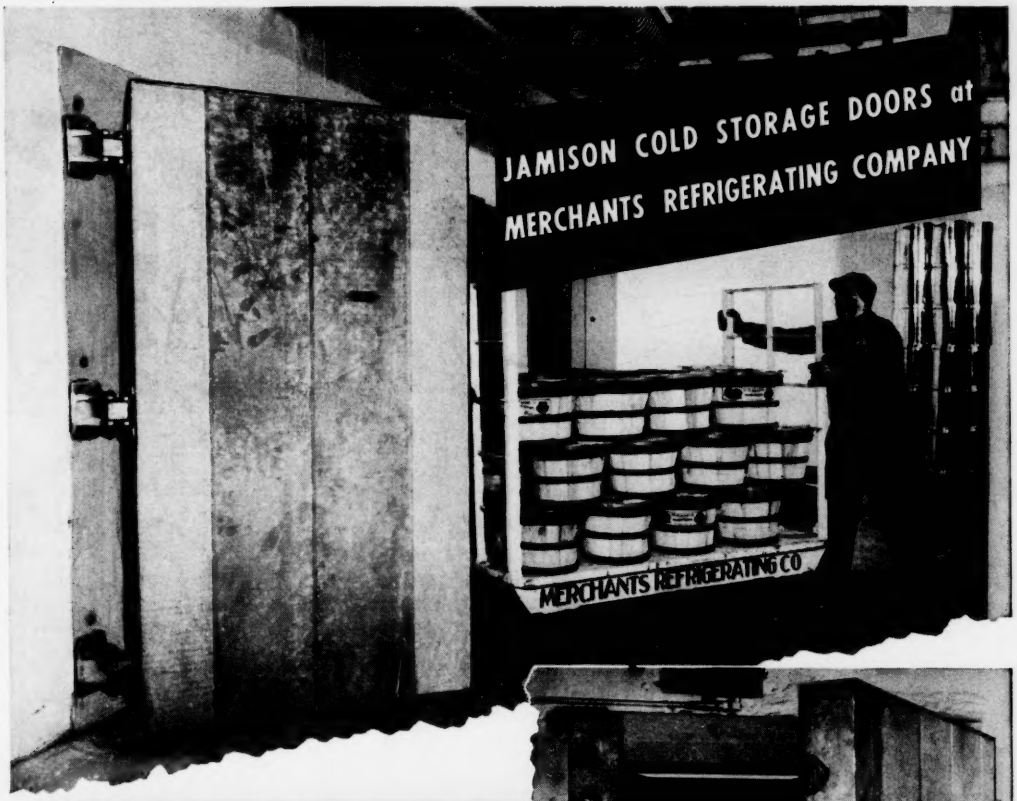
MATERIALS Ⓐ INSTALLATION

FOR ALL TEMPERATURES FROM 300° F. BELOW ZERO TO 2800° F.



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